DOCUMENT RESUME

ED 427 184 CE 078 068

TITLE	Project Future. A Workplace Literacy Project.
INSTITUTION	Jefferson County Public Schools, Louisville, KY.
SPONS AGENCY	Office of Vocational and Adult Education (ED), Washington, DC. National Workplace Literacy Program.
PUB DATE	1998-00-00
NOTE	523p.; For a related document, see ED 426 204. A project cooperatively conducted with Futura Plastics and Engineering, Louisville, KY.
PUB TYPE	Guides - Classroom - Teacher (052)
EDRS PRICE	MF02/PC21 Plus Postage.
DESCRIPTORS	Adult Basic Education; Adult Literacy; Arithmetic; Behavioral Objectives; Business Correspondence; Check Lists; Communication Skills; *Competency Based Education; Computer Literacy; Critical Reading; *Education Work Relationship; Fractions; Geometry; Internet; Learning Activities; Lesson Plans; *Literacy Education; Manufacturing Industry; Mathematics Skills; Measurement Techniques; *Numeracy; Percentage; *Plastics; Production Technicians; Reading Skills; Records (Forms); Statistics; *Workplace Literacy; Writing (Composition); Writing Skills

ABSTRACT

This document contains 12 units of study for a competency-based workplace literacy program, developed by Jefferson County Public Schools in Louisville, Kentucky, for a local plastics and engineering company. Each unit covers between two and nine competencies. Of the 12 units, 5 are devoted to language skills and 7 are devoted to mathematics. Each unit contains a lesson plan for each of the competencies taught in the unit. The lesson plans contain the following: lesson objectives, prerequisite skill(s); literacy skills addressed; detailed instructions for presenting the unit; evaluation activity; and extension activities. Also included in each unit are some or all of the following: student handouts; transparency masters; learning activities; and self-evaluation checklists. Many learning activities require learners to read and or complete reading texts, forms, and charts actually used at the company. The language skills unit topics are as follows: communicating; learning and using plastics vocabulary; interpreting work-related forms and charts; reading of workplace materials critically; and writing forms and letters. Mathematics topics include the following: understanding whole numbers; using fractions; using decimals; calculating percentages; measuring items with the common English and metric systems; understanding statistics; and understanding geometric concepts. (MN)

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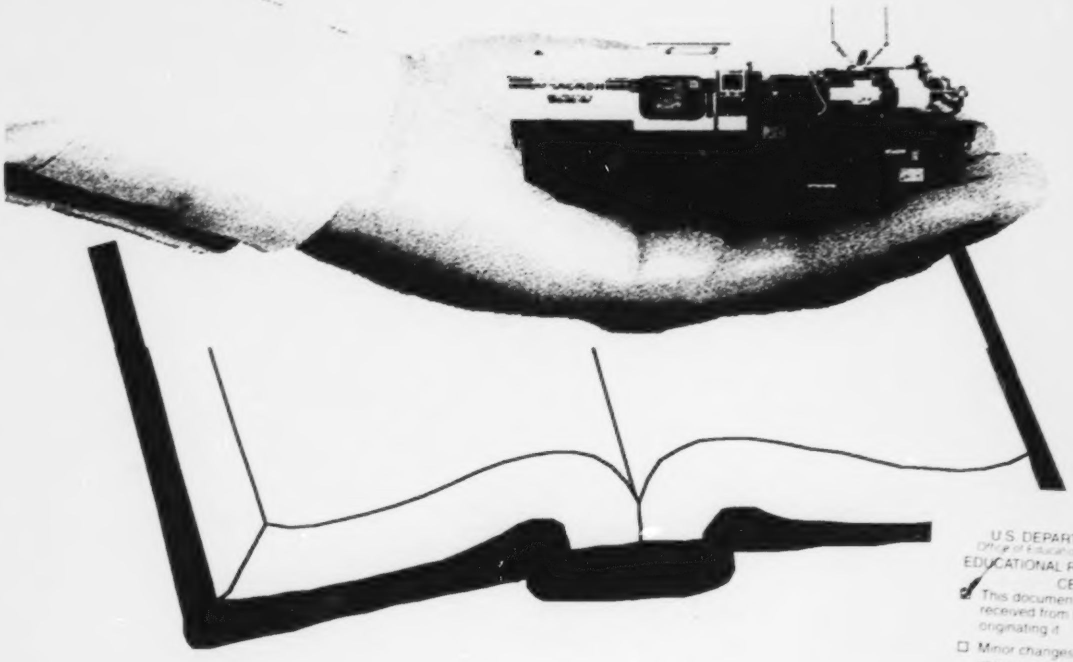
ED 427 184

Jefferson County Public Schools
Adult And Continuing Education and
Futura Plastics and Engineering, Inc.

Present

PROJECT FUTURE



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A Workplace Literacy Project Funded by The U. S.
Department of Education.

CE 078 068

Competencies for Plastics Industry Basic Skills Trainees

- 1.0 **Language Skills**
  - 1.1. **Communications**
    - 1.1.1. Use Appropriate Oral Communication Skills
      - 1.1.1.1. Follow and Give Directions
      - 1.1.1.2. Give and Take Criticism
    - 1.1.2. Function as Part of a Team
      - 1.1.2.1. Speak Before a Group
      - 1.1.2.2. Resolve Conflict
      - 1.1.3. Use the Telephone to Take Orders and Messages

  - 1.2. **Learn and Use Plastics Vocabulary**
    - 1.2.1. Understand and Pronounce Terminology Commonly Used in Plastics Production--General Employment Terms
    - 1.2.2 Understand and Pronounce Terminology Commonly Used in Plastics Production--Safety Words
    - 1.2.3 Understand and Pronounce Terminology Commonly Used in Plastics Production--Molding Process Terms
    - 1.2.4 Understand and Pronounce Terminology Commonly Used in Plastics Production--Quality Control Terms
    - 1.2.5. Using Correct Terminology to Identify Parts of the Injection Molding Press
    - 1.2.6 Using Correct Terminology to Identify Parts of the Injection Mold
    - 1.2.7. Correctly Spell Commonly Used Plastics Terminology
    - 1.2.8. Use Context Clues to Determine Meaning of Terms

  - 1.3. **Interpret Work-Related Forms And Charts**
    - 1.3.1. Interpret Inspection Instruction Sheets
    - 1.3.2 Interpret Quality Control Requirements Sheets
    - 1.3.3. Identify Product Defects and Complete Defects Sheets
    - 1.3.4. Demonstrate Understanding of Material Safety Data Sheets
    - 1.3.5. Interpret Production Schedules and Reports
    - 1.3.6. Understand Organizational Charts
    - 1.3.7. Understand Performance Appraisal Forms
    - 1.3.8. Complete a Bill of Lading

  - 1.4. **Read Workplace Materials Critically**
    - 1.4.1. Interpret Workplace Announcements and Notices
    - 1.42. Locate Information in Employee Regulations Manuals (Write Summary Sentences)
    - 1.4.3. Interpret Job Descriptions
    - 1.4.4. Use Dictionaries and Glossaries
    - 1.4.5. Demonstrate Understanding of Training Materials
    - 1.4.6. Understand Sequence of Events in the Production of a Part
    - 1.4.7. Understand Cause and Effect in the Production of a Part
    - 1.4.8. Use Comparison and Contrast to Determine Passable Parts
    - 1.4.9. Predict Outcome of Production Decisions

  - 1.5. **Writing Forms and Letters**
    - 1.5.1 Write Legible Product Labels
    - 1.5.2. Complete Box Count Sheets
    - 1.5.3. Complete an Incident Report Form
    - 1.5.4. Check Box Labels for Accuracy
    - 1.5.5. Complete a Vacation Request and Birthday Leave Request
    - 1.5.6. Write a Memo Explaining Work Absence
    - 1.5.7. Write a Resume with a Letter of Interest

2.0. Mathematics

2.1. Whole Numbers

- 2.1.1. Accurately Read and Copy Numbers
- 2.1.2. Count Number of Parts Per Box
- 2.1.3. Determine the Total Pieces Produced Per Shift
- 2.1.4. Determine the Difference Between the Total Shots and Actual Production
- 2.1.5. Determine the Daily Production
- 2.1.6. Determine the Average Scrap Dollars
- 2.1.7. Use a Calculator to Compute Mathematical Problems

2.2. Fractions

- 2.2.1. Read Measurements--Understand the Relationship of Fractions to Whole Numbers
- 2.2.2. Compute Fractions Using a Calculator

2.3. Decimals

- 2.3.1. Compare Average Machine Cycles to Standard Machine Cycles
- 2.3.2. Prepare Shift Analysis Reports
- 2.3.3. Compute Weekly Wages
- 2.3.4. Compute Averages from Production Reports

2.4. Percentages

- 2.4.1 Understand Relationship of Percentages, Decimals, and Fractions
- 2.4.2. Compute Percentage of Colorant in Molding Mixture
- 2.4.3. Calculate Shift Productivity, Average Scrap Percentage and Shift Loss Percentage
- 2.4.4. Calculate Taxes Deducted from Check

2.5. Measurement

- 2.5.1. Read and Interpret Common English and Metric Linear Measurement Instruments including Inch Rulers, Yard/Meter Sticks, Tape Measures, Calipers and Micrometers
- 2.5.2. Read and Interpret Common English and Metric Weight Measurement Instruments
- 2.5.3. Read and Interpret Common English and Metric Liquid Measuring Instruments
- 2.5.4. Compute Part Weight and Cost--Convert English and Metric Measurements
- 2.5.5. Read Production Gauges and Controls

2.6. Statistics

- 2.6.1. Read and Interpret Production Graphs
- 2.6.2. Determine Mean and Range
- 2.6.3. Determine Median and Mode
- 2.6.4. Determine Probability
- 2.6.5 Prepare Average and Range (XR) Charts and Histographs Used in Process Control

2.7 Geometric Concepts

- 2.7.1. Understand Geometric Shapes and Angles When Reading Blueprints
- 2.7.2 Determine Proper Size of Box for Number of Parts

Project Future
Competency Area 1.0: Language Skills

Competency Number 1.1: Communications

Lesson Number 1.1.1: Use Appropriate Oral Communication Skills

Lesson Number 1.1.1.1: Follow and Give Directions

Lesson Objective: Given a Self-Evaluation Checklist, the trainee will evaluate his/her performance in a given situation.

Prerequisite Skill: Ability to read simple sentences

Literacy Skills: The trainee will be able to give simple instructions and offer appropriate feedback on another performance.

Presentation:

I. The trainer will use the handout, Wavy message, to introduce the lesson. Discuss the effect the pattern has on the senses. Explain that a confusing message has a similar effect.

II. The trainer will use the handout, Communications, to discuss the need for learning more about effective speaking and listening skills. Explain that communication is just like any skill, it can be learned and refined. The more you practice, the better/worse you become. Use the handout, Body Language, to discuss how poor communications behavior can cause problems.

III. The trainer will use the handout, The Communication Process, and the board to explain the communication process.

A. Communication involves four parts:
The sender
The receiver
The message
Feedback

B. Communication does not take place until the receiver understands the message. The only way you can be sure of his/her understanding it is to receive feedback.

IV. The trainer will select a trainee to give directions for drawing the figures pictured in the handout, Squares, Triangles, and All the Angles. The trainees must not be allowed to look at the handout. They will be instructed to follow the directions of the selected trainee and draw the figure as described. The selected trainee must use only oral communication to get his/her point across. The other trainees may not ask any questions or communicate among themselves. After three or four minutes, the trainer will call time. The trainer will then ask the trainees to turn their drawings face down and use another sheet of paper for a new drawing. The same selected trainee will use the same drawing to give out directions. He/she may use body language. The other trainees may ask him/her questions that will help to complete the drawing. The trainer should lead the trainees to discuss the importance of giving clear instructions, asking questions for clarification, and giving feedback to check understanding.

V. The trainer will use the handout, Constructive Feedback, to summarize the discussion.

VI. The trainer must explain that all the parts of the communication process must be used when giving and following instructions. Costly mistakes occur when instructions are poorly given or poorly received. Use the board to compare the results of effective listening and the results of poor listening.

Results of Effective Listening	**Results of Poor Listening**
Get more information	Learn less about the job
Make fewer mistakes	Make more mistakes
Save time and money	Waste time and money
Improve work relationships	Create misunderstandings
Help solve problems	Cause problems

VII. The trainer will divide the class into two groups. Each group will have a Listening Situation to read and complete the questions listed. Ask each group to appoint a recorder, a reporter/leader, and a timekeeper. The groups will have five minutes to complete the assignment.

VIII. The groups will read their situations and reports.

IX. The trainer will use the handout, Verbal Skills and Active Listening Skills. The trainer will lead the class to discuss whether the skills listed were used.

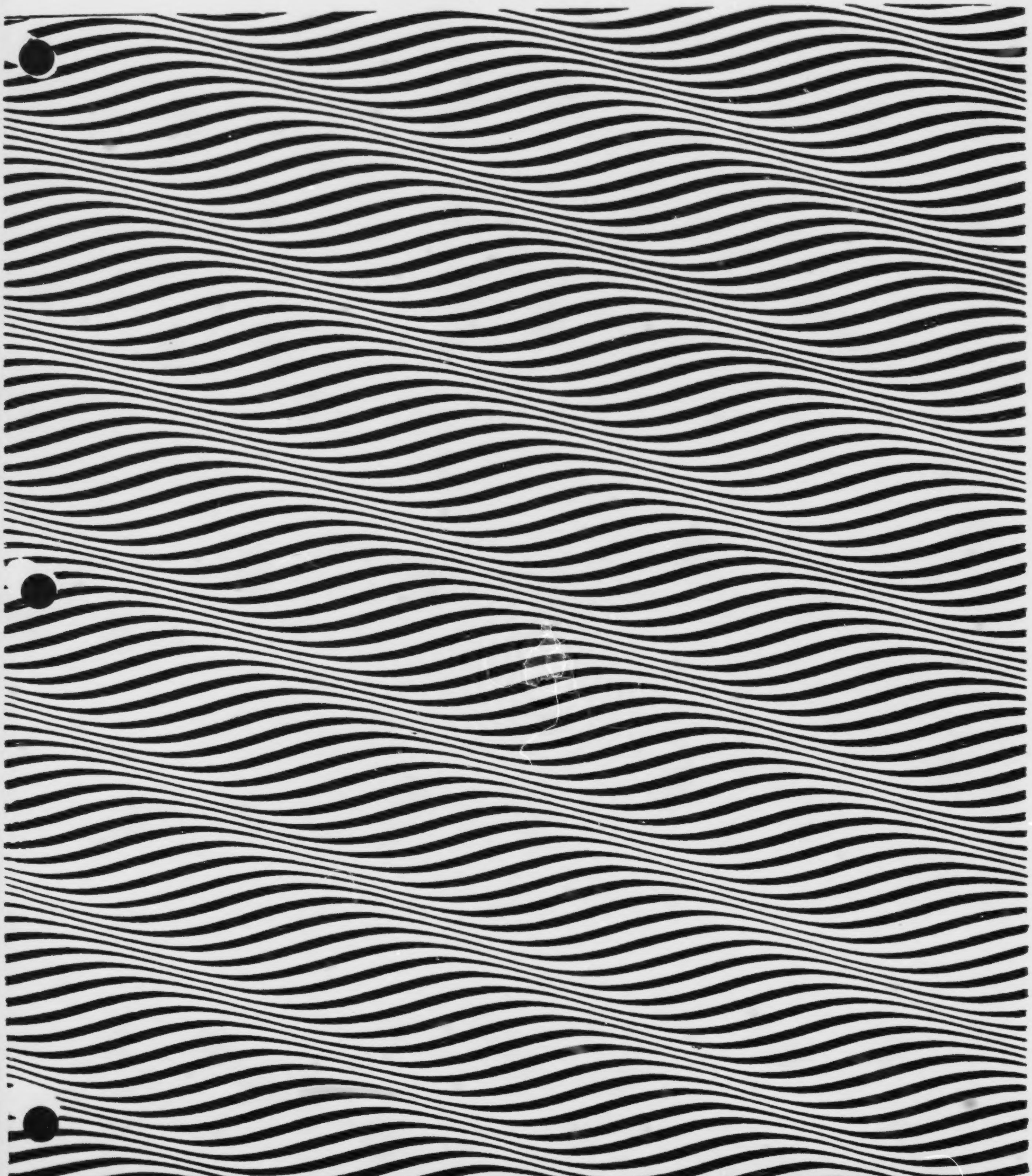
X. The trainer will use the handouts, Tips for Giving Successful Directions, Taking Directions, and Giving Directions, to introduce a new group assignment. The trainees remain in the same groups. Using the handouts as guidelines, the groups will select a simple task on the production floor and develop a set of directions for the task.

XI. The trainer will give out two copies of the handout, Tips for Giving Successful Directions, to each trainee. The trainer will give directions for trainees to record the name of the speaking reporter at the top of the form. The group reporter of each group will select a trainee form the other group and give the directions to the selected trainee from the other group. As the group reporter is giving the directions, all trainees will use the Tips for Successful Directions to evaluate the directions. The groups will reform, tally the responses, and discuss the changes they should make in the directions.

Evaluation: The trainee will complete the Self-Evaluation Checklist to evaluate how he/she reacted when giving and receiving instructions.

Extension: If time permits, the trainer will have the trainees write a brief outline of the steps to complete a project or a job, such as mowing the lawn or baking a cake. The trainees will share these with each other or with a family member.

Wavy Message



Communications

Daily Communication on the JOB:

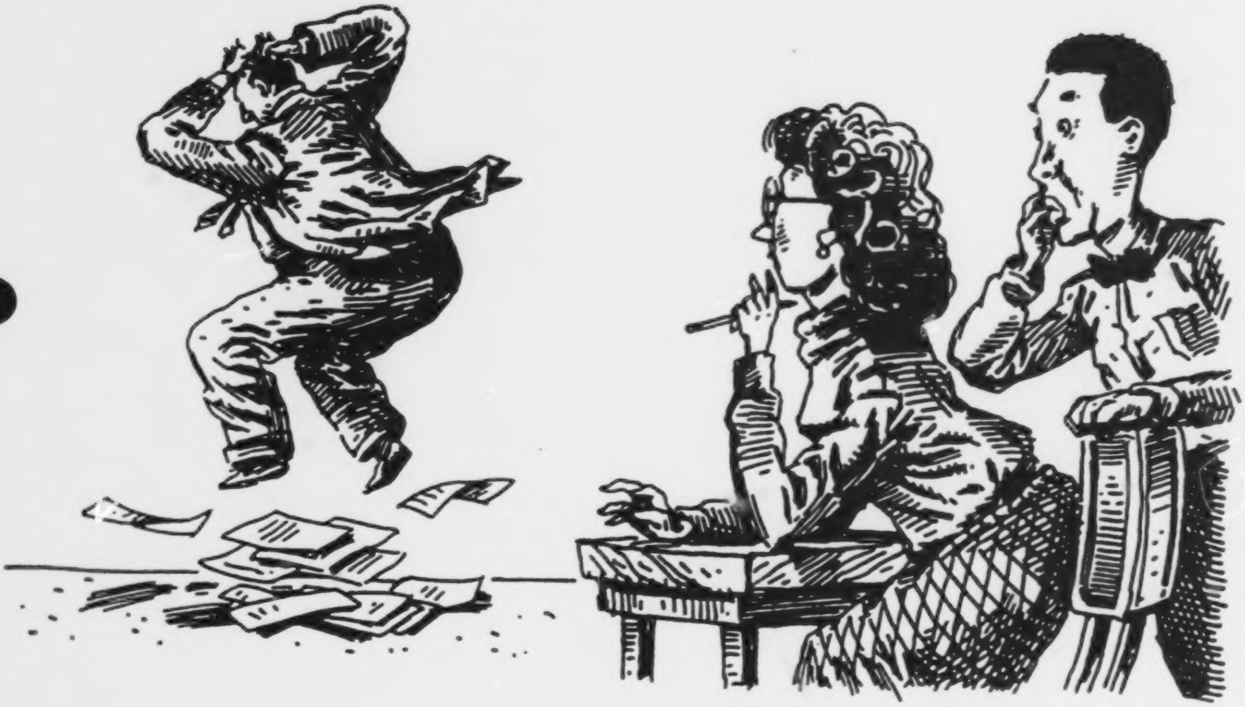
Writing:	**9% (completing charts, reports, etc.)**
Reading:	**16% (studying instructions, machine dials, charts, etc.)**
Speaking:	**30% (giving directions, asking questions, etc.)**
Listening:	**45% (receiving directions, status reports, instructions, etc.)**

Time Spent Specifically Learning the Skills Listed Above:

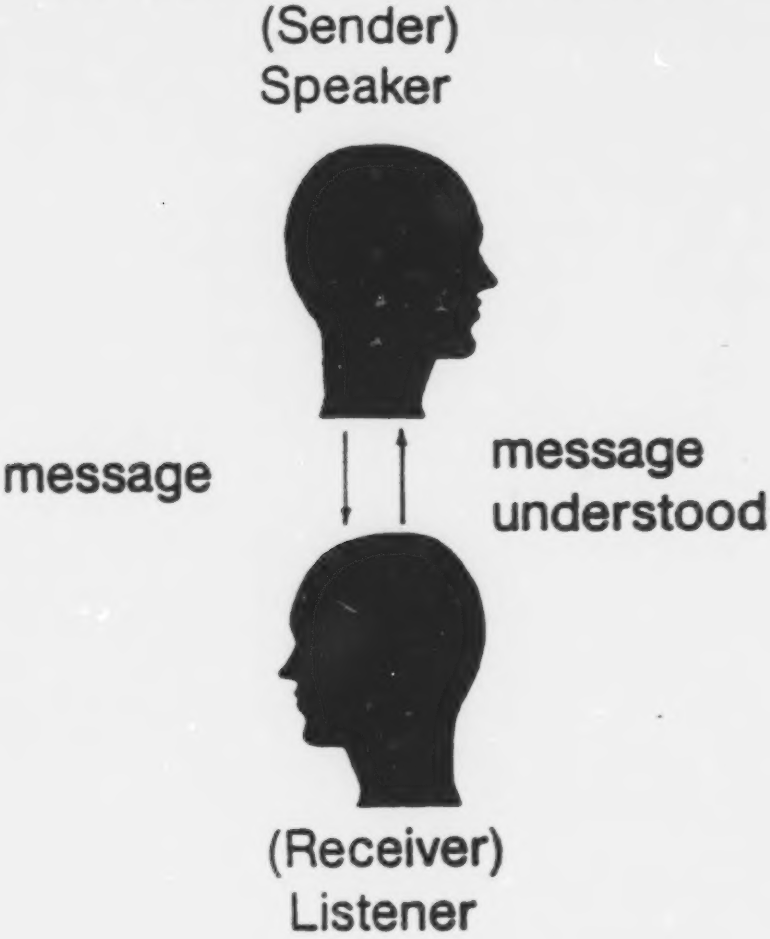
Writing:	**Kindergarten through Grade Twelve**
Reading:	**Kindergarten through Grade Eight**
Speaking:	**6 weeks to one year (infancy)**
Listening:	**None**

BODY LANGUAGE

It communicates more than words!



The Communication Process


(Sender)
Speaker
message
message understood
(Receiver)
Listener

Both speaker and listener must actively participate in the communication process. Each needs to make sure that the message is clearly conveyed and accurately received.

Listening Situation 1

You have arrived at Futura. You are barely on time because your car had a flat tire. Fortunately you had planned to run an errand before work. It was early enough that you were able to get the tire successfully changed and were going to be at Futura at your normal time that is 15 minutes early. However, you ran into a traffic jam just as you came off the interstate. Thanks to some quick thinking and a wild and wooly ride through the back of the industrial park, you made it, with two minutes to spare.

Just as you clock-in, you are told that you will be running a new machine. You have never run this machine. The Quality Control Person needs to give you instructions on how to operate the machine properly. The operator from the last shift is using the grinder, which is less than five feet away to grind up what seems like half the production from his shift. The QC seems to be in quite a hurry and is giving rapid-fire verbal directions.

- List the factors involved in this situation that will affect your ability to listen.

- What do you need to do to be able to listen effectively?

- What ideas do you have that might improve this situation in the future?

Listening Situation 2

You have injured your back loading a truck. As the day progresses, your pain becomes unbearable. Futura sends you to the doctor. After being asked to strip to the waist in the 60-degree examining room, the nurse informs you that the doctor will be right with you. Of course, your pain is even worse than before. After 20 minutes, the poor, underpaid Dr. Quackabee breezes into the room to examine you. You explain that you are in excruciating pain and must have some relief. After the examination, Dr. Quackabee disappears for several minutes (it just seems like hours!). When he returns, he is holding two bottles of sample medications. He gives you the verbal directions. On the way out to door, he mumbles, "Any questions?"

- List the factors involved in this situation that will affect your ability to listen.

- What do you need to do to be able to listen effectively and follow the doctor's direction?

- What ideas do you have that might improve this situation?

Verbal Skills

1. **Keep it simple.**

What's the one main idea you want your listeners to remember? Be able to say it simply, in one short sentence.

2. **Explain and/or provide an example.**

Once you've stated the point you're trying to make, express the point in different words to explain it. You also can present an example of what you mean. This will help your listeners understand and apply your point.

3. **Use clear, direct words.**

The point of speaking is to have the listeners understand your message. Therefore, use language that can be easily understood. Don't talk over your listeners' heads.

4. **Respect your listeners.**

Keep your listeners' interests in mind. Let them know how the information will help them, and tell them how to apply it. If you're speaking to an individual, use the person's name. People are complimented when their names are used. Finally, always treat your listeners as persons who are important.

5. **Repeat your main idea.**

Before you finish your message, repeat your main idea. Repeating the main idea will emphasize it and help the listeners remember it.

6. **Check for understanding.**

Ask if you can clarify anything or if your listener has any questions. If you wish to check whether the listener understood the message correctly, try comments such as, "I'm not sure I said that clearly; let me hear what you think I said."

ACTIVE LISTENING SKILLS

1. It is impossible to listen and talk at the same time.
2. Listen for the speaker's main ideas.
3. Be sensitive to your emotional deaf spots.
4. Fight off distractions.
5. Try not to get angry.
6. Do not trust to memory certain data that may be important.
7. Let your listeners tell their own story first.
8. Empathize with your listener.
9. Withhold judgment.
10. React to the message, not the person.
11. Try to appreciate the emotion behind the speaker's words (vocal and visual messages) more than the literal meaning of the words.
12. Use feedback.
13. Listen attentively.
14. To the degree that it is in your power, try to create a positive listening environment.
15. Ask questions.
16. Be motivated to listen.

Giving Directions

- **Think about the entire task.** Visualize in your mind each of the steps that make up the task. List each step, with a drawing if necessary.

- **Summarize the task.** Help your listener see the entire task by giving him/her the big picture first. Use comparisons he/she is familiar with to further help the listener see what this task is like.

- **Organize the task.** Break the task into a logical step-by-step process and explain how to do each step. Use drawings and gestures to help clarify. Include accurate measurements, distances, or directions (up, down, left, right).

- **Repeat as necessary.** Reword and repeat your explanation for any steps that are especially complicated. Speak slowly and clearly. Use short sentences, or long phrases, during the most important parts of the explanation.

- **Ask for questions.** Ask the listener if he/she has any questions. Answer each one clearly.

- **Review the process.** Ask the people you are instructing to review the process for you by performing the task or talking you through it step-by-step.

Taking Directions

☐

☐ **Listen to the whole direction – even the preview and summary instructions.** Try to understand the whole task before the person giving the directions gets into the specific steps.

☐ **Listen to the steps.** Pay attention and think about how to do each step. Take notes if necessary.

☐ **Ask for clarification.** Ask questions or restate (in your own words) what you have been told, to help you understand the whole task and each of the steps.

☐ **Follow the steps in order.** Follow the instructions you have been given. Make sure you finish the task correctly and on time.

☐ **Ask for help.** If you try to do the task and are not making good progress, ask for help. Don't risk a major mistake just because you are afraid to ask.

Tips for Giving Successful Directions

Place a check mark in the box if you asked yourself :

Did I:

- ☐ **Think and speak clearly?**
- ☐ **Demonstrate the procedure (if possible), explaining as you go?**
- ☐ **Use proper terms and define them when necessary?**
- ☐ **Cover all steps and directions?**
- ☐ **Watch the listener's face carefully for signs of boredom or confusion?**

Self Evaluation Checklist
(Communications)

	Most times	Many times	Some-times	Few times
When I have an important message, I select the best time to approach the listener.				
When I am speaking, I think about how the listener might react to what I am going to say.				
When I am listening, I tune out if the person says something I don't want to hear.				
When I am listening, I repeat in my own words what the speaker has just said.				
When I am speaking, I think about what I am going to say before I begin to speak.				
When listening, I look at the person who is speaking.				
When listening, I form a rebuttal in my head while the speaker is talking.				
When I am speaking, I avoid eye contact with listeners.				
When speaking, I assume that listeners share my background and attitudes.				
When I am listening, I repeat in my own words what the speaker has just said.				

	Most times	Many times	Some-times	Few times
When speaking, I pronounce my words clearly and correctly.				
When speaking, I monopolize the conversation.				
When listening, I concentrate on what is being said even if I am not really interested.				
When listening, I take notes when necessary to help me remember.				

Project Future
Competency Area 1.0: Language Skills

Competency Number 1.1: Communications

Lesson Number 1.1.1: Use Appropriate Oral Communication Skills

Lesson Number 1.1.1.2: Give and Take Criticism

Lesson Objective: Given checklist, the trainee will evaluate the performance of other trainees in a given situation and give constructive criticism based on the checklist.

Prerequisite Skill: Ability to read simple sentences

Literacy Skills: The trainee will be able to listen to give constructive criticism and react appropriately
The trainee will be able to take simple constructive criticism and react appropriately

Presentation:

I. Trainer will introduce the lesson by reading the following criticism:

> "Hey," I said, "box the FIS 828's in three layers with 12 in each layer! Are you sleeping on the job again? Do I have to hold your hand all day? You must be the densest employee I've ever had!"
>
> Have any of you been criticized like that? Then you know how these insensitive criticisms can hurt. What other consequences could these types of criticisms have? Possible answers may be anger, fighting, reduced production form the employee criticized and the production and morale of the employees witnessing the insensitive criticism may be affected.
>
> Giving and taking criticism constructively is extremely important both at home and at work. Criticism allows an experienced person to teach and correct. But criticism that is too broad, too harsh, or too personal often ends up hurting more than helping.

II. The trainer will select two trainees for a small role-play situation. The trainer will need a baseball for the role-play. Have the trainees role-play the handout, Pitching a Curveball: An Exercise in Criticism.

Obviously, the pitching instructor knows how to give directions and criticize effectively. He gives a clear instruction. Then he gives the criticism in a positive way.

A person who cannot give criticism well has limited ability to help someone else correct a problem. A person who cannot take criticism well is limited to using only his or her ideas and insights.

III. Use the handout, Tips for Giving Criticism, the trainer will lead the trainees in a discussion of the principles listed. The trainer will ask trainees to give examples to each that they may have observed. Why is each principle important?

IV. Use the handout, Giving Criticism, to summarize the steps necessary to give constructive criticism.

V. Review the concepts in the handout, Assertive Messages

VI. Use the handout, Taking Criticism, to summarize the steps necessary to take criticism on the job.

VII. Review the concepts in the handout, Some Notes on Non-Defensive Reactions and Responses

VIII. Divide the trainees into pairs. Pass out a note card to each of the pairs. The note card should contain a brief workplace scenario. Have the trainees prepare a role-play illustrating giving and taking criticism.

IX. Have trainees evaluate the role-plays using the handout, Tips for Giving Criticism.

Evaluation: When given a note card with a workplace scenario, a pair of trainees will present a role-play modeling giving and receiving criticism. The trainees will evaluate the rope-plays using a checklist.

Extension: The trainees will report on and practice a situation at home with a child or partner in which he has used correct methods of either receiving or giving constructive criticism.

Pitching a Curveball
An Exercise in Criticism

Trainee 1 will give the directions. Trainee 2 will follow the directions.

- When you pitch a curveball, spread your fingers over the seams like this.
- Not bad, but your fingers are too close together. Spread em out. Yeah, like that.
- Then release the ball with a snap of the wrist like this.
- Good try, but remember to snap it, really snap it! A twist will give you a hang ball, and you want a curve.

Tips for Giving Criticism

Place a check mark in the box if your role-play followed these guidelines.

- ☐ **See yourself as a teacher or coach, as instructing. Keep I mind that you are trying to help someone improve.**
- ☐ **Pick the right time to offer criticism. Make sure the person has not just been shaken by some other incident.**
- ☐ **Stay calm. Don't blow the situation out of proportion.**
- ☐ **Be courteous, concise, and fair. Show you care. Express your sincere concern about sharing ways the other person can boost his or her success.**
- ☐ **Avoid giving the impression that you are more concerned with seeing your ideas put into practice than in helping the other person improve.**
- ☐ **Avoid sarcasm, temper tantrums, or any form of rudeness. Avoid telling people they "*should* do such and such" or *should* have done such and such." *Shoulds* make you look rigid and inflexible, like a know-it-all.**
- ☐ **Listen carefully to identify any old, new, or hidden problems.**
- ☐ **Stick to the issue at hand.**
- ☐ **Keep the discussion impersonal.**

- **Give specific suggestions and show how the person will benefit from your suggestions.**
- **Leave the door open for further discussion or action.**

Giving Criticism

- **Think about the problem.** Limit criticism to a problem that the listener can understand and fix. Think about what the problem is and how the listener can solve.

- **Think about your goal.** What do you want to happen after you speak?

- **Think about the listener.** Will the person benefit from the criticism? Does the listener have special needs that will make it difficult to use the criticism constructively?

- **Think about the setting.** Is this setting the best time and place to give the criticism?

- **Shape the message.** State the problem and solution clearly. Attack the problem, not the person. Whenever you can, mention things that the person does well.

- **Rehearse the message.** Practice by saying the criticism out loud or to yourself.

- **Deliver the message.** Speak in an honest, positive tone. Observe closely in order to learn if the listener:
    - understands the problem,
    - takes ownership of the problem,
    - is committed to working toward a solution, and
    - feels your support in achieving the solution.

ASSERTIVE MESSAGES

Constructive communication requires a careful, well-worded assertion message. It must be an "I" message, and it needs three parts:

- **Behavior of other. "When you…" (this must be specific, observable behavior, not assumptions or interpretations).**
- **My response. "I feel…."**
- **The tangible effects on me. "Because….."**

Reasons why assertive messages fail:

1) **The behavior mentioned is not specific enough.**
2) **The statement is not clear of inferences, labeling, blaming.**
3) **The statement is not objective enough (it contains character assassinations, negative judgements.)**
4) **It is not brief enough.**
5) **It is not about the real issue.**
6) **It is directed to the wrong person (a scape goat).**

7) It is not a true feeling, (i.e., anger expressed when children are late, when the true feeling was worry; or the feeling stated is larger than it really is, for example, "hate" rather than "annoyed").

8) The "effect" is on someone else. Don't send assertive messages for a third party

9) The message has a "solution" built in. Don't back the other person into a corner.

Taking Criticism

- **Listen for the message.** Listen for main points in the message by asking, "What is the problem?" Listen for the solution by asking, "What is my part in the solution, and will it fix the problem?"

- **Respect the speaker.** Think about the person's ideas rather than how to defend yourself against those ideas, regardless of how the speaker delivers the criticism.

- **Value criticism.** Remember, it helps you to understand that a problem exists, why it exists, and how it can be resolved.

- **Respect yourself.** Take and use criticism daily. Respect yourself by being one who takes criticism calmly, evaluates it carefully, uses what is good, and courteously disposes of the rest.

SOME NOTES ON NON-DEFENSIVE REACTIONS AND RESPONSES

When we react, we need to use all of the pieces of our communication model, for example:

1 **Self-awareness:**

What is the problem for me?
What do I feel?
What do I want?

2 **Awareness of others:**

I need to be aware of the readiness of the other person.
What is going on with him/her?
How can he/she best hear me?

3 Values:

My ideas about situations and my respect for other people and their rights will affect how I react.

4 Responsibility:

I need to be clear that:

a) I am responsible for my feelings, responses, actions.
b) I am not responsible for the feelings or actions of others.
c) I am not responsible for controlling the outcome of the confrontation, but only for my part in it.

5 Skills:

Here's where we need them all: empathy, listening, self-disclosure, flexibility.

Project Future
Competency Area 1.0: Language Skills

Competency Number 1.1: Communications

Lesson Number 1.1.2: Function as Part of a Group

Lesson Number 1.1.2 1: Speak before a Group

Lesson Objective: Given a self-evaluation checklist, the trainee will evaluate his/her performance

Prerequisite Skill: Ability to read and write simple sentences

Literacy Skills: The trainee will be able to listen to and present a five-minute lesson to a group.

Presentation:

1. The trainer will introduce the lesson by placing the picture of the duck/bunny face sown on the table in front of each trainee. On the count of three, the trainees will turn over the picture and say aloud what they see. The trainer will comment on the fact that everyone saw the same picture, but not everyone saw the same thing. Many communication errors and costly errors happen this way. When the message is important, people must be careful to say exactly what was meant.

   This is particularly important when speaking before a group of co-workers. The trainer will lead the group to discuss the differences and similarities between casual meetings around the soft drink machine and formal team/production meetings. The trainer will divide the dry-erase board in half and label the columns, formal meetings and casual meetings. The trainer will record the trainees' responses in the correct column.

2. The trainer will ask the trainees to call out the occasions when they might be asked to speak before a group as part of their job. As the trainees call out occasions, the trainer will write them on the board. Some examples may be:

   Team Meetings
   Committees
   Employment/Management meetings
   Training a new employee
   Union meetings

3. Using the handout, Non-Verbal Communication, the trainer will demonstrate the behaviors in the handout while leading the trainees in discussion how these behaviors might influence a communication and why they are important considerations when speaking before a group.

4. Using the handout, Guidelines for Effective Speaking : Practical Tips You Can Use, the trainer will explain the steps of planning effective messages for a group.

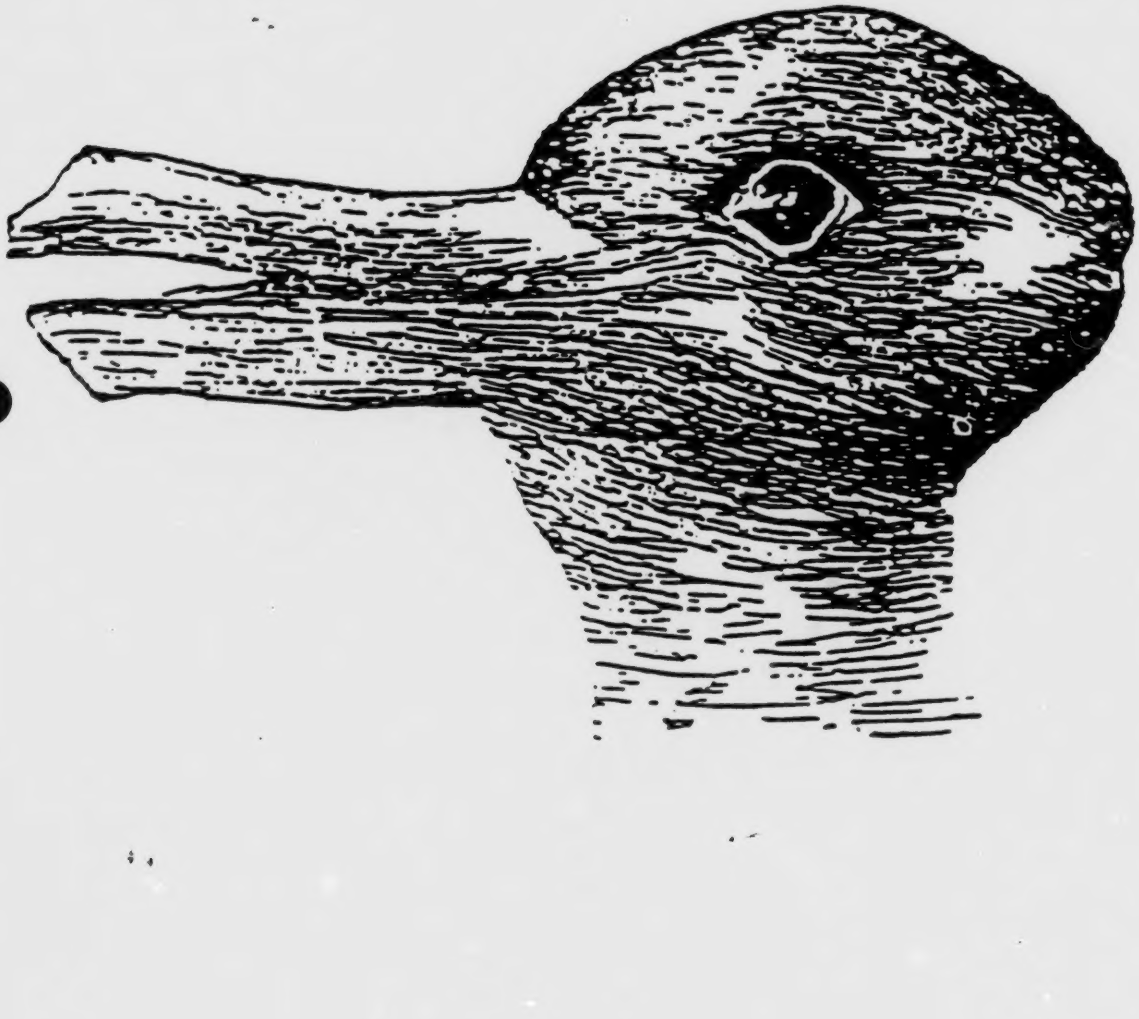
5. The trainer will discuss the information from the handout, Effective Visuals for Effective Communication.

6. Each trainee will select an occasion from the board and prepare a five minute presentation appropriate for the occasion. The trainees will complete the exercise, Group Speaking Plan, while planning their presentation

7. The trainees will give their presentations.

Evaluations: The trainee will evaluate his/her performance by completing the Self-Evaluation Checklist, Speaking before a Group.

Extension: The trainees will prepare an appropriate presentation to an insurance agency explaining the family's need for coverage.



NON-VERBAL COMMUNICATION

Learn how to interpret and use body language to deliver your message.

Did you know 90% of the meaning transmitted between people in face-to-face situations can come via the non-verbal channel?

By understanding body language we can begin to understand and read the emotions and attitudes of workers and friends. In addition, this skill will help improve others' understanding of you.

GESTURES are similar to words in a sentence. Consider the gesture in relation to everything else that is going on around you. (noise)

Body language is communicated through the eyes, face, hands, arms, legs, sitting and walking.

EYES

The eyes are "Windows of the Soul." It is believed that an honest person will look you straight in the eye. People avoid eye contact when an uncomfortable question is asked.
Raising one eyebrow – disbelief
Raising both eyebrows – surprise
Left-lookers and Right-lookers – people tend to look to either the right or the left, depending on which thoughts dominate their mental activity.
    Left – emotional, subjective
    Right – logical, detailed

FACE

Most reliable reading of a person's attitudes, emotions and feelings
"You can read his/her faces like an open book."
"Poker face."
Frowns, smiles, clenched jaws, pouting lips

HANDS

Clenched or wringing hands, pressure, strong disagreement with you, will be difficult to relate to these people
Steeppleness - smugness, self-confidence
Hands behind the back – authority, superiority
Rubbing behind the ear – doubt
Rubbing the eye – uncertain
Rubbing the neck – frustration
Leaning back, supporting head – confidence
Cupping hands over face – hiding something
Hand resting on cheek – thinking, critical evaluation

ARMS AND LEGS

Crossed arms – defensiveness
Crossed legs – disagreement and negativity

SITTING AND WALKING

Legs over the arm of a chair – uncooperative attitude, rebellious
Straddling the seat – dominant attitude
Hands in pocket – secretive and critical
Walk fast and swing – confident, know where they are going

Guidelines for Effective Speaking:
Practical Tips You Can Use

Select your topic. Identify what you want to talk about. What do you want the listener to know or do?

Analyze your audience. Determine what the listener already knows about the topic. Think about the listener's past experience and about previous conversations the two of you may have had. Understanding the listener will help you adapt your choice of words and your explanation of details to match the listener's knowledge of your topic.

Plan the message. Decide what main points you need to make. Find a clear order in which to present them.

Send the message. Speak at a comfortable rate. Maintain eye contact so the listener knows you are concerned that he or she is getting the message. Emphasize key points: Repeat or restate them; pause; or use signal expressions such as First, In addition, or It's important to know that…. Check your listener's understanding: Observe the listener's face and gestures and accept his/her questions.

Encourage the listener's response. Invite the listener to ask questions or to comment on the message.

Effective Visuals for Effective Communication

In his book, *Presentations Plus*, David A. Peoples, a consulting instructor of IBM, says that people gain 75 percent of what they know visually, 13 percent through hearing, and a total of 12 percent through smell, touch, and taste. A picture, he says, is three times more effective than words alone, and words and pictures together are **six times** more effective than words alone.

Purposes of Visuals:

☞ **To attract and maintain attention -** The average person speaks about 110 to 160 words per minute, but he/she thinks at a rate of 400 to 500 words per minute. Visual stimulation can keep them tied to the presentation.

☞ **To reinforce main ideas** - We put much more emphasis on what we see than on what we hear.

☞ **To illustrate and support the spoken word -** A *well-chosen* picture is worth a thousand words.

☞ **To minimize misunderstanding -** Visuals can give meaning to concepts not clearly understood. They also address the visual learner's need to see it rather than to hear it.

☞ **To increase retention -** Confucius said: "What I hear, I forget; what I see, I remember; what I do, I understand."

☞ **To add a touch of realism** - Visuals bring a touch of the real world into the presentation.

☞ **To save both time and money -** Visuals help us communicate more clearly and quickly, so the concept is understood more quickly. In business, any time that time is saved, money is saved.

☞ **To aid in organizing your thoughts -** Visuals help provide a logical path for speaker *and* listener to follow.

☞ **To ensure covering key points -** Visuals remind the speaker not to forget key points and help him/her to cover them in a logical order.

☞ **To build confidence in yourself -** Visuals help you to be more relaxed because you don't have to remember everything. You have a 'road map.'

Types of visuals:

Films
Opaque Projectors
Chalk/Marker Boards
Videotapes
Pictures
Simulations
Computer Graphics
Posters
Objects
Slides
Models

What Makes a Good Visual?

Is the Visual Clear?
Is it obvious, at a glance, what the visual you are using is trying to communicate?

Is It Readable?
Can people actually SEE the information, or is the material so complex, or the type so tiny, that it's not visible to most of your audience.

Does the Visual Communicate a Single Idea?
Is the audience able to focus on one key point, as you expand on your visual, or are your thoughts cluttered because more than one idea is presented?

Is It Relevant?
Does the audience know why you're using the visual? Does it make a point that fits in with the presentation?

Is It Interesting?
Does it help focus and keep the audience's attention?

Is It Simple?
Is it easy for the audience to relate to the visual; or is it so busy, so detailed, so cluttered with graphics, so colorful, so full of various typefaces that it is difficult to focus on?

Is It Accurate?
Does it clearly show what it is supposed to show? Is the information the most current and relevant?

What Makes a Good Visual?

Is the Visual Clear? 👓

Is It Readable? 📖

Does the Visual Communicate a Single Idea? 💡

Is It Relevant? ☯

Is It Interesting? 😐

Is It Simple? 👍

Is It Accurate? 💻

Information taken from *Creative Training Techniques Handbook*, Robert W. Pike, Lakewood Books, 50 South Ninth Street, Minneapolis, MN 55402

Group Speaking Plan

Read through the following questions. The indented questions will give you some ideas about how to answer the question that is in bold type. Use the second sheet to answer these questions about your presentation.

Who is my audience?
- What is my relationship with this group?
- What is the communication style of most of the group members?

What do I want to say?
- What information do I want to convey?
- What feelings and opinions do I want to express?
- What are the key points?
- What is the appropriate sequence?

Why do I want to communicate this message?
- What is my purpose?
- What do I want to happen?

How will I communicate this message?
- What is the best method for sending this message?
- What back-up method, if any, should I use?

When will I communicate?
- What is the best timing for the message?

Where will I communicate?
- What is the best setting for this communication?
- How should I handle distractions?

Answer these questions to help you are plan your presentation.

Who is my audience?

What do I want to say?

Why do I want to communicate this message?

How will I communicate this message?

When will I communicate?

Where will I communicate?

Self-Evaluation Checklist

Speaking before a Group

Evaluate your performance by placing a check mark in the appropriate column.

During my presentation:	**Most times**	**Some times**	**Few times**
I was prepared.			
My visual aids were appropriate for the presentation and the group.			
I was nervous but overcame my nervousness.			
I started on time.			
I ended on time.			
I allowed time for questions and encouraged them.			
I handled any questions appropriately.			
I knew the facts about my presentation.			
I anticipated questions and was prepared with an answer ahead of time.			
I maintained eye contact with the audience.			
I was organized.			
I selected an appropriate topic.			
I analyzed my audience.			
I spoke at a comfortable rate.			
I emphasized key points by repeating or restating them at least once.			
I paid attention to the gestures and expressions of the audience.			

Project Future
Competency Area 1.0: Language Skills

Competency Number 1.1: Communications

Lesson Number 1.1.2: Function as Part of a Group

Lesson Number 1.1.2.1: Resolve Conflict

Lesson Objective: The trainee will demonstrate his/her understanding of conflict resolution by completing the exercise Understanding Conflict Resolution.

Prerequisite Skill: Ability to read and write simple sentences.

Literacy Skills: The trainee will be able to complete sentences.
The trainee will be able to match synonyms.

Presentation:

I. Prior to the class time, the trainer will select two trainees. The trainer will explain to each trainee separately that this is a contest to see if he/she can convince the other person to cross over the rope that will be placed between them. The trainer will place a rope between the trainees. After the trainees have tried for a while, the trainer will want to lead the class to observe the methods the trainees used to try to convince the other person to come over to their side.

II. The trainer will use the Conflicts overhead (or a handout) to lead the class into discussion about the types of conflicts they may encounter at work. The trainer will list these on the board. Responses will vary. However, these may be common:

Between co-workers
Between supervisors and employees they supervise
Between management and supervisors
Between union and management
Between company and customer
Between departments within the company

III. In order to discover their style of handling conflict, trainees will complete the Conflicts exercise. After the handout is completed and the trainees score it, the trainer will ask employees to identify in their own mind one person that they know who is one of the five styles. Ask them to identify (not aloud) in their minds the style of the person with whom they have the most conflict.

IV. Use the handout - Conflict Resolution Styles - to summarize the discussion. This is a theory that says each person can utilize each of these styles in a particular situation. This handout states in brief when the best time to use each particular style may be.

V. Using the handouts, Three Steps to Solving Interpersonal Conflict and Noteworthy Ideas/Dealing With Conflict, the trainer will lead a discussion on ways to resolve a conflict.

VI. The trainer will break the trainees into groups of at least four members. The groups will appoint a timekeeper, a recorder, and a reporter. The trainees will complete the exercise, Who Gets the New Truck?

VII. The groups will report their decisions.

VIII. Using the handouts, Guidelines for Showing a Positive Attitude: Practical Tips You Can Use and Non verbal Communication Behavior Cues, the trainer will discuss ways to avoid unnecessary conflicts. The trainer will use the cartoon, The Far Side, to point out the importance of using good communication skills to avoid and resolve conflicts.

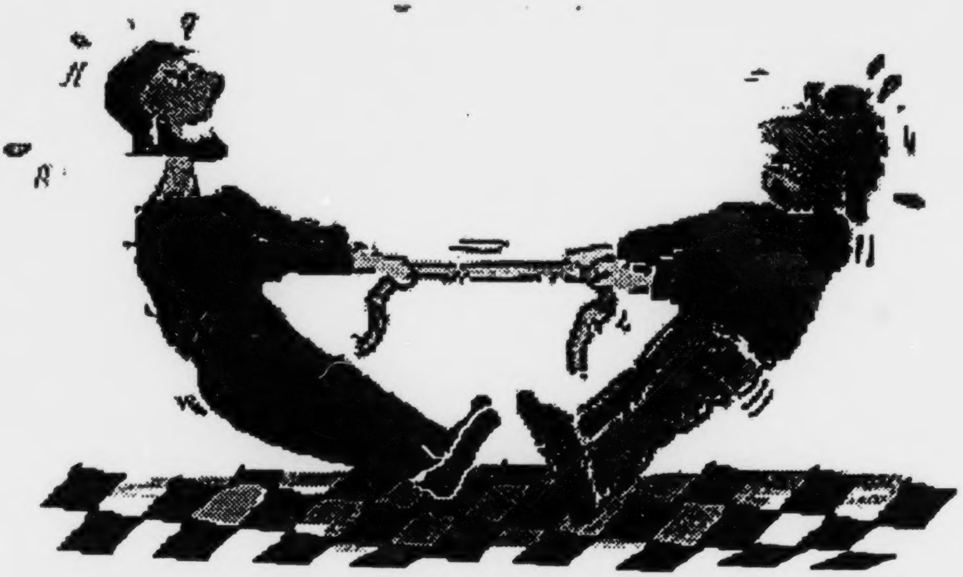
Evaluation: The trainees will complete the exercise, Understanding Conflict Resolution.

Extension: The trainees will describe a situation in their personal lives involving a conflict that they would handle differently now.

Conflicts

Conflicts are created not because anyone is "inherently bad" but because we each look at things from a unique perspective.

CONFLICT



**CONFLICTS ARE CREATED
NOT BECAUSE ANYONE IS
"INHERENTLY BAD"
BUT BECAUSE WE
EACH LOOK AT THINGS
FROM A UNIQUE PERSPECTIVE**

How I Act in Conflict

The proverbs listed below can be thought of as descriptions of some of the different strategies for resolving conflicts. Proverbs state traditional wisdom. These proverbs reflect traditional wisdom for resolving conflicts. Read each of the proverbs carefully. Using the scale given below indicate how typical each proverb is of your actions in a conflict.

5 = Very typical of the way I act in a conflict
4 = Frequently typical of the way I act in a conflict
3 = Sometimes typical of the way I act in a conflict
2 = Seldom typical of the way I act in a conflict
1 = Never typical of the way I act in a conflict

______ 1. It is easier to refrain than to retreat from a quarrel.
______ 2. If you cannot make a person think as you do, make him/her do as you think.
______ 3. Soft words win hard hearts.
______ 4. You scratch my back, I'll scratch yours.
______ 5. Come now and let us reason together.
______ 6. When two quarrel, the person who keeps silent first is the most praiseworthy.
______ 7. Might overcomes right.
______ 8. Smooth words make smooth ways.
______ 9. Better half a loaf than no bread at all.
______ 10. Truth lies in knowledge, not in majority opinion.
______ 11. He who fights and runs away lives to fight another day.
______ 12. He hath conquered well that hath made his enemies flee.
______ 13. Kill your enemies with kindness.
______ 14. A fair exchange brings no quarrel.
______ 15. No person has the final answer but every person has a piece to contribute.
______ 16. Stay away from people who disagree with you.
______ 17. Fields are won by those who believe in winning.
______ 18. Kind words are worth much and cost little.
______ 19. Tit for tat is fair play.
______ 20. Only the person who is willing to give up his/her monopoly on truth can every profit from the truths that others hold.
______ 21. Avoid quarrelsome people as they will only make your life miserable.
______ 22. A person who will not flee will make other flee.
______ 23. Soft words ensure harmony.
______ 24. One gift for another makes good friends.
______ 25. Bring you conflicts into the open and face them directly; only them will the best solution be discovered.
______ 26. The best way of handling conflicts is to avoid them.
______ 27. Put your foot down where you mean to stand.
______ 28. Gentleness will triumph over anger.
______ 29. Getting part of what you want is better than not getting anything at all.
______ 30. Frankness, honesty, and trust will move mountains.
______ 31. There is nothing so important you have to fight for it.
______ 32. There are two kinds of people in the world, the winners and the losers.
______ 33. When one hits you with a stone, hit him/her with a piece of cotton.
______ 34. When both people give in halfway, a fair settlement is achieved.
______ 35. By digging and digging, the truth is discovered.

From: Reaching Out: Interpersonal Effectiveness and Self Actualization by David W. Johnson

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Withdrawing	Forcing	Smoothing	Compromising	Confronting
_____ 1.	_____ 2.	_____3.	_____4.	_____5.
_____ 6.	_____ 7.	_____8.	_____9.	_____10.
_____ 11.	_____ 12.	_____13.	_____14.	_____15.
_____ 16.	_____ 17.	_____18.	_____19.	_____20.
_____ 21.	_____ 22.	_____23.	_____24.	_____25.
_____ 26.	_____ 27.	_____28.	_____29.	_____30.
_____ 31.	_____ 32.	_____33.	_____34.	_____35.
_____Total	_____Total	_____Total	_____Total	_____Total

The higher the total score for each conflict strategy, the more frequently you tend to use that strategy. The lower the total score for each conflict strategy, the less frequently you tend to use that strategy.

CONFLICT STRATEGIES: WHAT ARE YOU LIKE?

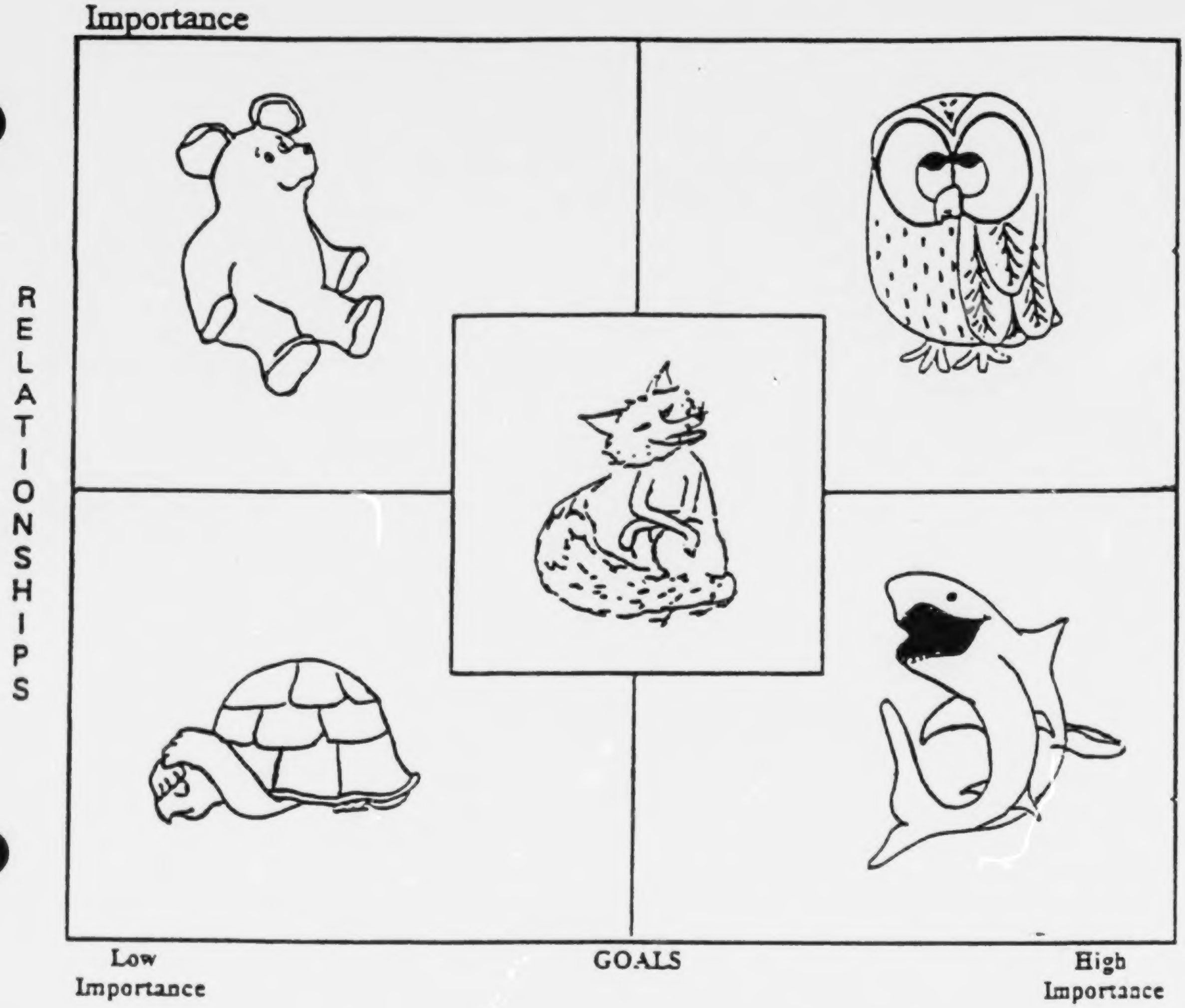
Different people use different strategies for managing conflicts. These strategies are learned, usually in childhood, and they seem to function automatically. Usually we are not aware of how we act in conflict situations. We just do whatever seems to come naturally. But we do have a personal strategy, and because it was learned, we can always change it by learning new and more effective ways of managing conflicts.

When you become engaged in a conflict, there are two major concerns you have to take into account:

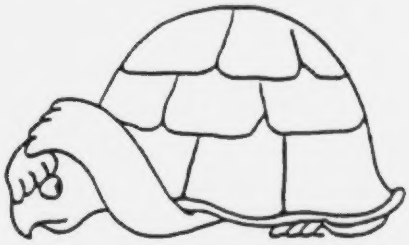
1. Achieving your personal goals - you are in conflict because you have a goal that conflicts with another person's goal. Your goal may be highly important to you, or it may be of little importance.

2. Keeping a good relationship with the other person - you may need to be able to interact effectively with the other person in the future. The relationship may be very important to you, or it may be of little importance.

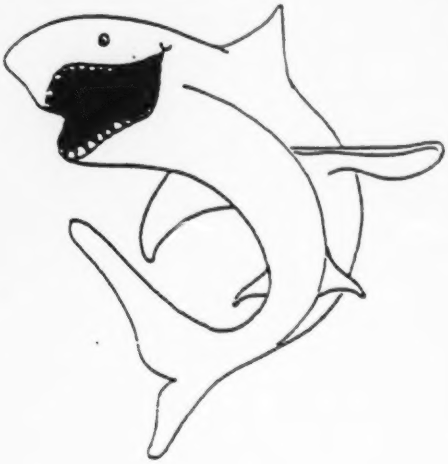
How important your personal goals are to you and how important the relationship is to you affects how you act in a conflict. Given these two concerns, five styles of managing conflicts can be identified:


Importance
RELATIONSHIPS
Low Importance
GOALS
High Importance

1. *The Turtle* (Withdrawing). Turtles withdraw into their shells to avoid conflicts. They give up their personal goals and relationships. They stay away from the issues over which the conflict is taking place and from the people they are in conflict with. Turtles believe it is hopeless to try to resolve conflicts. They feel helpless. They believe it is easier to withdraw (physically and psychologically) from a conflict than to face it.



2. *The Shark* (Forcing). Sharks try to overpower opponents by forcing them to accept their solution to the conflict. Their goals are highly important to them, and the relationship is of minor importance. They seek to achieve their goals at all costs. They are not concerned with the needs of other people. They do not care if other people like or accept them. Sharks assume that conflicts are settled by one person winning and one person losing. They want to be the winner. Winning gives sharks a sense of pride and achievement. Losing gives them a sense of weakness, inadequacy, and failure. They try to win by attacking, overpowering, overwhelming, and intimidating other people.

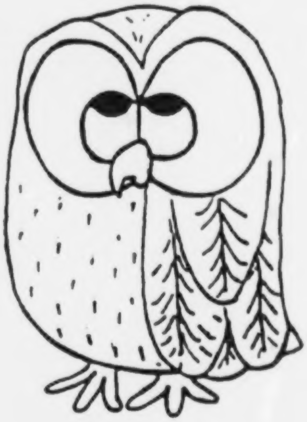


3. The Teddy Bear (Smoothing). To Teddy Bears, the relationship is of great importance, while their own goals are of little importance. Teddy Bears want to be accepted and liked by other people. They think that conflict should be avoided in favor of harmony and believe that conflicts cannot be discussed without damaging relationships. They are afraid that if the conflict continues, someone will get hurt, and that

would ruin the relationship. They give up their goals to preserve the relationship. Teddy Bears say, "I'll give up my goals, and let you have what you want, in order for you to like me." Teddy Bears try to smooth over the conflict in fear of harming the relationship.

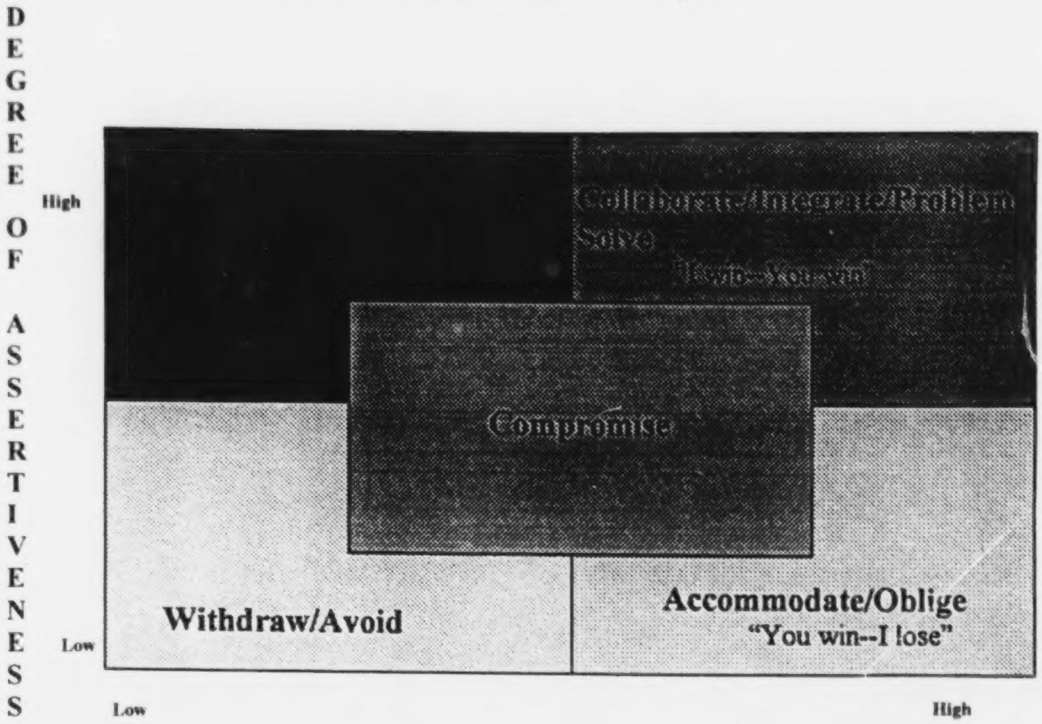
4. *The Fox* (Compromising). Foxes are moderately concerned with their own goals and about their relationships with other people. Foxes seek a compromise. They give up part of their goals and persuade the other person in a conflict to give up part of his goals. They seek a solution to conflicts where both sides gain something - the middle ground between two extreme positions. They are willing to sacrifice part of their goals and relationships in order to find agreement for the common good.

5. The Owl (Confronting). Owls highly value their own goals and relationships. They view conflicts as problems to be solved and seek a solution that achieves both their own goals and the goals of the other



person in the conflict. Owls see conflicts as improving relationships by reducing tension between two people. They try to begin a discussion that identifies the conflict as a problem. By seeking solutions that satisfy both themselves and the other person, owls maintain the relationship. Owls are not satisfied until a solution is found that achieves their own goals and the other person's goals. And they are not satisfied until the tensions and negative feelings have been fully resolved.

Conflict Resolution Styles


DEGREE OF ASSERTIVENESS
High
Low
Collaborate/Integrate/Problem Solve
"I win--You win"
Compromise
Withdraw/Avoid
Accommodate/Oblige
"You win--I lose"
Low
High

- **Withdraw/Avoid:** Appropriate when the issue is minor and the costs outweigh the benefits.
- **Accommodate/Oblige:** Encourages cooperation. You sacrifice your own needs to preserve the relationship over the long term. You give up something now to eventually get something of value in return.
- **Compromise:** Labor-management negotiations often use a compromise technique. Split the difference. Dangerous if one party knows that always compromises – they may bring inflated demands to the table. Valuable time can be wasted negotiating.
- **Compete/Force/Dominate:** Appropriate in resolving issues like the wearing of safety glasses because the potential safety factor is more important than the employees' personal feelings. May foster resentment and cause long-term harm.
- **Collaborate/Integrate/Problem Solve:** Time-consuming. Find out what the other side really wants and show them a way to get it while you get what you want. Mutual trust and respect are generally the primary gain of this style.

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Three Steps to Solving Interpersonal Conflict

1. Actively Listen: (reflect back to the other person; his/her words and feelings).

2. Identify your position (state your thoughts and feelings about the situation).

3. Explore alternative solutions (brainstorm other possibilities).

Noteworthy Ideas
Dealing with Conflict

Ask those who disagree to paraphrase one another's comments. This may help them learn if they really understand one another.

Work out a compromise. Agree on the underlying source of conflict, then engage in give-and-take and finally agree on a solution.

Ask each member to list what the other side should do. Exchange lists, select a compromise all are willing to accept, and test the compromise to see if it meshes with team goals.

Have the sides each write 10 questions for their opponents. This will allow them to signal their major concerns about the other side's position; and the answers may lead to a compromise.

Convince team members they sometimes may have to admit they're wrong. Help them save face by convincing them that changing a position may well show strength.

Respect the experts on the team. Give their opinions more weight when the conflict involves their expertise, but don't rule out conflicting opinions.

WHO GETS THE NEW TRUCK?

As a group, comma you are to develop a solution to the following problem:

Your company has decided to purchase a new Chevrolet truck to replace one of the old trucks used by your crew of technicians who drive to various locations in the area to do repair work. The repair crew consists of five individuals, each assigned to a truck over which he has complete responsibility. Each has expressed a desire to be the recipient of the new truck. Obviously, you can only give the new truck to one of them.

Your problem is to decide who gets the new truck and how to go about effectively implementing this decision in order not to alienate the entire crew. Remember that you have complete control over all equipment and may do all the redistribution you choose. The people, circumstances, and arguments involved in this situation are as follows:

George has been with the company 17 years, has a two-year old Ford truck. When the new Chevrolet truck becomes available, George feels he should get it because he has the most seniority and doesn't like his present truck. His personal car is a Chevrolet, and he prefers a Chevrolet truck such as the one he drove before he got the Ford.

Bill has been with the company 11 years, has a five-year old Dodge truck. Bill feels that he deserves the new truck since his is the oldest in the fleet and he has the second greatest amount of seniority in the company. Further, Bill has taken excellent care of his present truck, keeping it looking like new. He thinks he ought to be rewarded for his efforts in treating the company truck 'as if it were his own.'

John has been with the company 10 years and has a four-year old Ford truck. The nature of John's duties is such that he has to do more driving than the other individuals since he works in the suburbs. He has a fairly old truck and thinks he should have the new one since he has so much driving to do.

Charlie has been with the company ten years, has a four year old Ford truck. The heater in Charlie's present truck is inadequate. It seems that the door to his truck was never properly repaired after the accident in which Hank backed into Charlie's door. The door lets in too much cold air now, and Charlie is susceptible to frequent colds that he attributes to the truck. Since Charlie has a good deal of driving to do, his only concern is that he has a good, safe, comfortable truck to drive. He doesn't care about the make.

Hank has been with the company three years, has a five year old Chevrolet truck. Hank has the poorest truck of the crew. It is old and before Hank got it, it was involved in a serious wreck. It has never been good, and Hank has put up with it for three years and feels that it's about time he got a good truck to drive. Despite his minor accident with Charlie's truck, Hank has a good driving record. Hank prefers Ford products.

OK. That's the problem. You have 15 minutes (or less) to come up with a solution that will satisfy all parties concerned.

Understanding Conflict Resolution

Complete the following statement about conflict. You may choose your answer from the terms below. Terms may be used more than once.

Accommodate/Oblige Compete/Force/Dominate
Actively Listen
Bear
Collaborate/Integrate/Problem Solve
Unique perspective
Compromise
Explore Alternatives

fox
Identify Your Position
owl
shark
turtle
Withdraw/Avoid

1. Conflicts are created not because anyone is inherently bad but because we each look at things from a ____________________________.

1. My style of conflict resolution is ____.

2. My supervisor's style of conflict resolution is ______________________________.

3. The ____________________ withdraws to avoid conflict. They give up their personal goals and relationships.

4. The ____________________ is moderately concerned with their own goals and about their relationships with other people.

5. The ____________________ thinks that the relationship is of greatest importance, and their own goals are of little importance.

6. The ____________________ tries to overpower opponents by forcing them to accept their solution to the conflict.

7. The ____________________ values his own goals and relationships.

8. The ___________________ method is used when the issue is minor and the costs outweigh the benefits.

9. The ___________________ method is used often in labor-management negotiations. In this method you split the difference.

10. The ___________________ method is appropriate in resolving issues like wearing safety glasses because the potential safety is more important than the employees' personal feelings.

11. The ________________ method is time-consuming. Mutual trust and respect are generally the primary gain of this style.

Name the three steps to solving interpersonal conflict.

1. ______________________________

2. ______________________________

3. ______________________________

Place the letter of the matching response in the blank to the left of each number. Letters may be used more than once.

_____ 1. Dull, quite tone of voice

_____ 2. Firm and clear tone of voice

_____ 3. Strident and loud tone of voice

_____ 4. Facial expression related to emotions

_____ 5. Hesitant, jerky flow of speech

_____ 6. Posture is upright or relaxed

_____ 7. Fast and sometimes clipped speech

_____ 8. Arms crossed, strides about, finger-pointing and arm-waving

_____ 9. Hand-wringing and hunched shoulders

_____ 10. Nervous movements and stepping back

_____ 11. Chin thrust forward, jaw firm, scowls and raises eyebrows

_____ 12. Fluent and even speech pattern

_____ 13. Smiling when being criticized

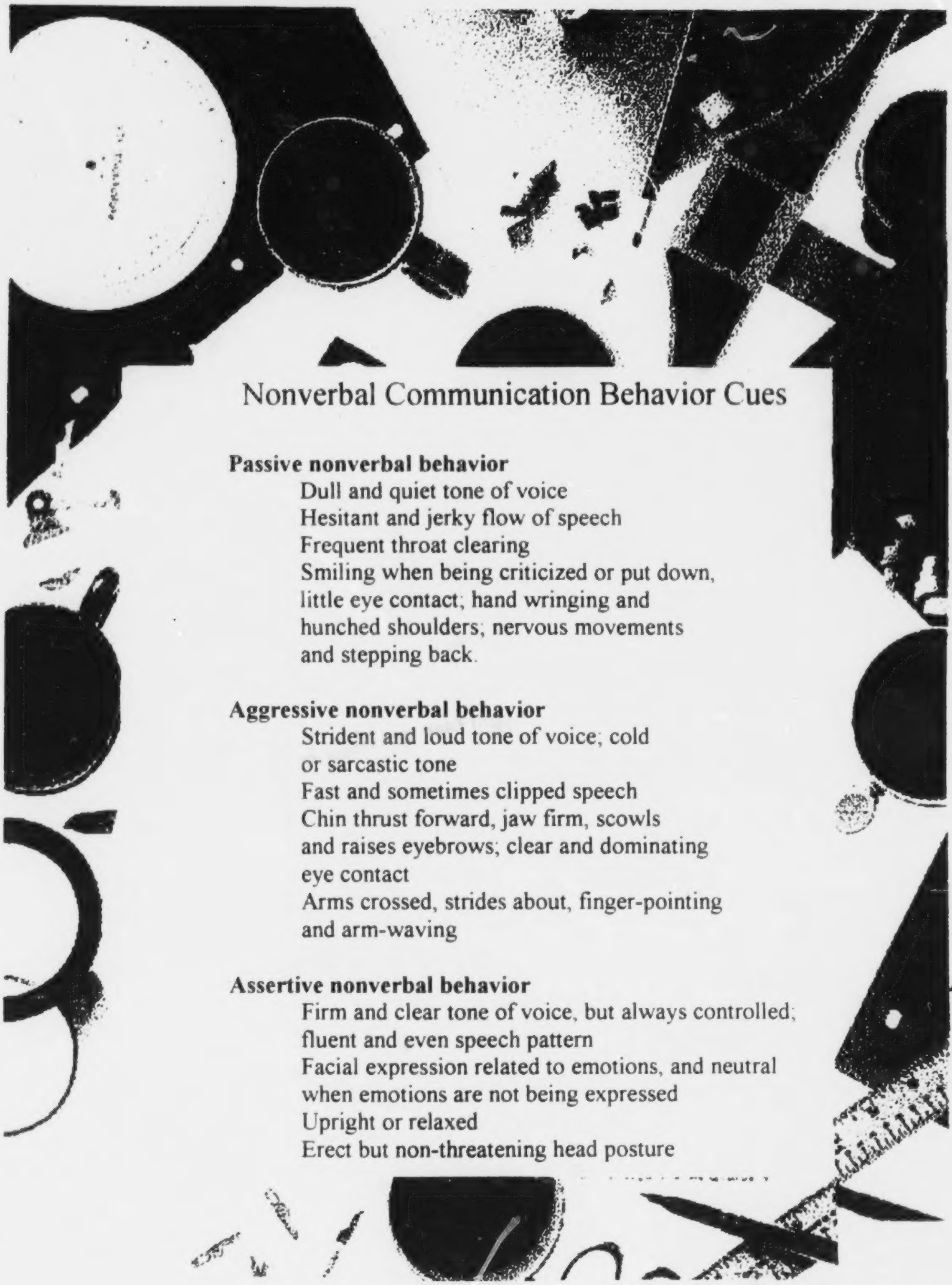
_____ 14. Frequent throat clearing

_____ 15. Little eye contact

A. Passive non verbal behavior

B. Aggressive non verbal behavior

C. Assertive non verbal behavior



Nonverbal Communication Behavior Cues

Passive nonverbal behavior

Dull and quiet tone of voice
Hesitant and jerky flow of speech
Frequent throat clearing
Smiling when being criticized or put down, little eye contact; hand wringing and hunched shoulders; nervous movements and stepping back.

Aggressive nonverbal behavior

Strident and loud tone of voice; cold or sarcastic tone
Fast and sometimes clipped speech
Chin thrust forward, jaw firm, scowls and raises eyebrows; clear and dominating eye contact
Arms crossed, strides about, finger-pointing and arm-waving

Assertive nonverbal behavior

Firm and clear tone of voice, but always controlled; fluent and even speech pattern
Facial expression related to emotions, and neutral when emotions are not being expressed
Upright or relaxed
Erect but non-threatening head posture

Telephone Exercise

Read through the three telephone messages in this lesson before reading them to the group. You must be familiar with their content in order to do a little role pplaying when you read each monologue.

Distribute telephone message pads. Ask trainees to jot down notes as you talk.

Message 1

Is Randy in? This is Debbie at Fisher Price. Tell him I came by today after lunch, but he wasn't there. Tell him I'll come by first thing in the morning, probably around 8:00. If that's not convenient, tell him to call me at the office before 5:00. My number is 476-9876.

Message 2

Hello, is Bob there? (pause)
What time do you expect him to come in? (pause)
Well, I'll be gone by then. I'd like to leave a message.
Do you have a paper and pen? (pause)
Please tell him Greg of Johnson Control called.
I have set up a meeting for him with the purchasing agent at 10:40 Wednesday morning. He should meet him at the main office. If Bob has any questions, he can reach me before tomorrow morning at 925-3546. Thank you.

Listen as I read the next message 3.

This is Suzy. I know Mr. Hose is busy reworking a mold right now, but when he is available, please tell him I called. I'm almost finished with the drafting job he ordered, but I still don't have the exact specifications for the diameter of the FP40897. And he said it was essential that I have these completed by noon tomorrow. My number is 327-4909. I'll be here only until three o'clock. I will be leaving town for the next two weeks. Please have him call me.

Message 4

This is George Donnelly, quality control at Webber. I want to speak to Bill Smith right now! This @#&*@*#*%#@ truckload of trash he sent is full of defects. I don't care if he's on his deathbed! Get him on this telephone right now! (pause) When he gets his rear end in there, you have him call me.

How will you handle Mr. Donnelly? What additional information will you need to take an effective message? What will you have to do to get that information?

IMPORTANT MESSAGE

FOR ____________________

DATE ____________ TIME ________ A.M. P.M.

M ____________________

OF ____________________

PHONE ____________________
AREA CODE NUMBER EXTENSION

☐ FAX

☐ MOBILE ____________________
AREA CODE NUMBER TIME TO CALL

TELEPHONED		PLEASE CALL	
CAME TO SEE YOU		WILL CALL AGAIN	
WANTS TO SEE YOU		RUSH	
RETURNED YOUR CALL		WILL FAX TO YOU	

MESSAGE ____________________

SIGNED

TOPS FORM 74600
LITHO IN U.S.A.

100% RECYCLED

Prize Winning Telephone Techniques
Placing the Call

- ☐ **Have a plan. Write out the most important point you are going to say before you dial.**

- ☐ **Remember that you may be interrupting the person receiving the call, so start slowly giving him/her time to refocus his/her attention. Remember that you are representing your company and yourself.**

- ☐ **Identify yourself and your company.**

- ☐ **Speak clearly and carefully.**

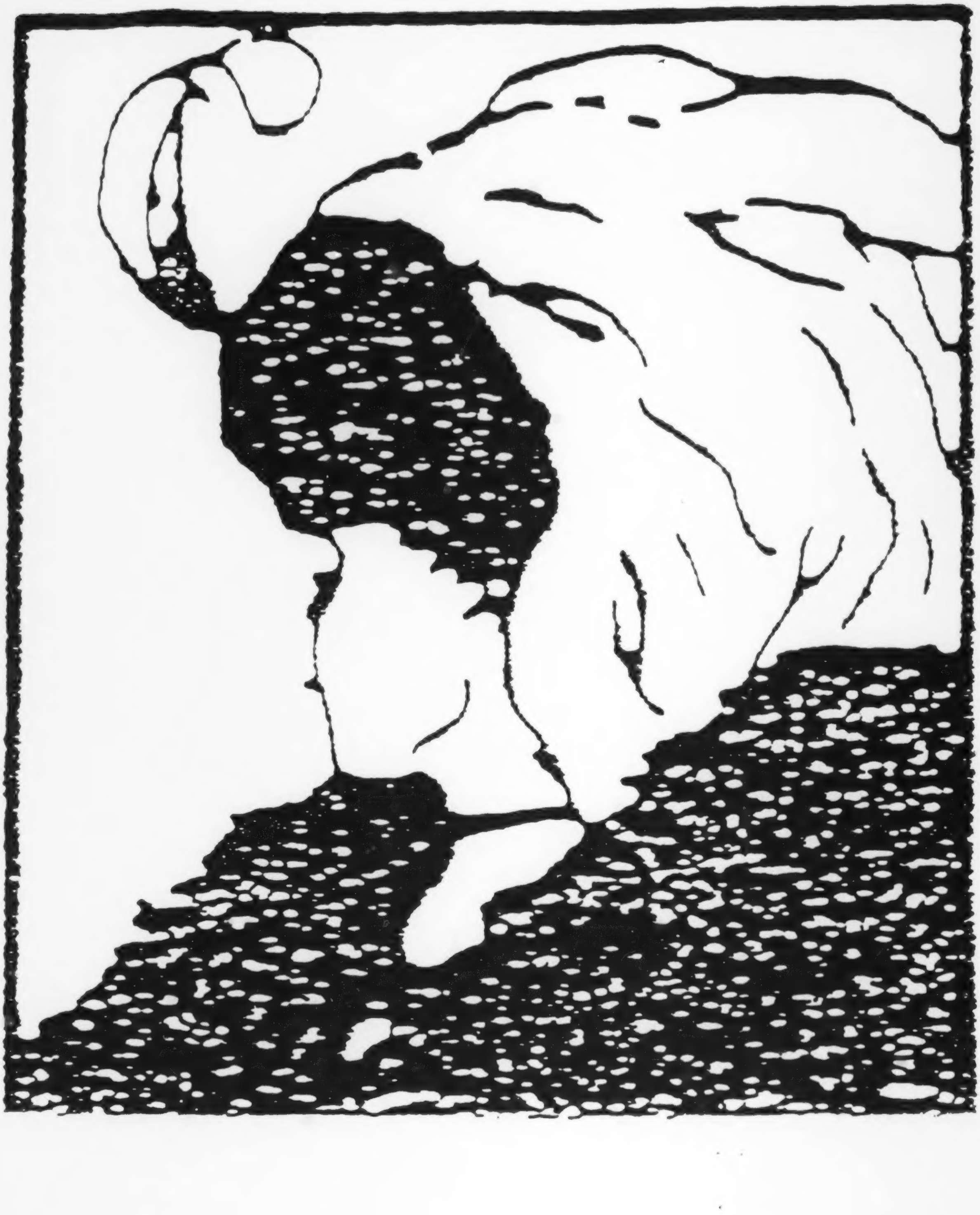
- ☐ **Restate the main points to the receiver of the call.**

- ☐ **If you must leave a message, repeat the most important facts (if the receptionist does not offer to first):**
  - ☐ **Who is the message for**
  - ☐ **The date and time**
  - ☐ **Your name and your company**
  - ☐ **Your telephone number**
  - ☐ **Any message**

- ☐ **If the message is critical, ask the person taking the message if he/she has any questions.**

Prize Winning Telephone Techniques
Receiving the Call

- Have a plan. Keep pen and pencil near the phone.
- Look at the "interruption by the caller" as an opportunity to sell your company and yourself.
- Identify yourself and your company.
- Listen carefully.
- Write down only the most important facts including:
  - Who the message is for
  - The date and time
  - Who the caller is and his/her company
  - The telephone number of the caller
  - Any message
- Use clear abbreviations.
- Restate the main points to the caller.
- Ask questions to clarify.
- Reread the message after hanging up and fill in any blanks.



Project Future
Competency Area 1.0: Language Skills

Competency Number 1.1: Communications

Lesson Number 1.1.2: Function as Part of a Group

Lesson Number 1.1.2.1: Use the Telephone to Take Orders and Messages

Lesson Objective: The trainee will demonstrate effective communication skills when simulating working with customers and clients on the telephones.

Prerequisite Skill: Ability to read and write simple sentences.

Literacy Skill: The trainee will be able to read sentences.

Presentation:

I. Prior to class, the trainer must secure several telephone message pads from the company supply room.

II. The trainer will introduce the lesson by giving out the handout of the old woman/young girl. The trainer will explain that although some people saw something different, we were able to work through the confusion. Why? We were all able to look at the picture. We were able to talk to one another and explain what we saw--maybe point out the areas we saw. We were all present. When we take a telephone message for someone else, we have to draw a picture well enough to paint a clear enough picture clear enough for them to accurately take action.

III. The trainer will explain that when people are talking face-to-face, they use their hands, their face, their voices, their entire body to communicate. But when they are using the telephone, they can't see body language or the look on the other person's face. So using the phone requires very clear speaking and active, focused listening. Often, the trainee must pick up clues from the tone or speed of the caller's voice. Allow time for discussion or demonstrations.

IV. The trainer will explain that when talking on the telephone, trainees may have to pay even more attention. Perhaps the other person doesn't speak clearly. Or the caller may have an accent that the trainee is not used to. When these situations occur, the trainee must concentrate very carefully and ask the caller to repeat what he or she just said.

V. Use the handout, Prize Winning Telephone Techniques: Receiving the Call, to discuss important steps in taking an accurate telephone message.

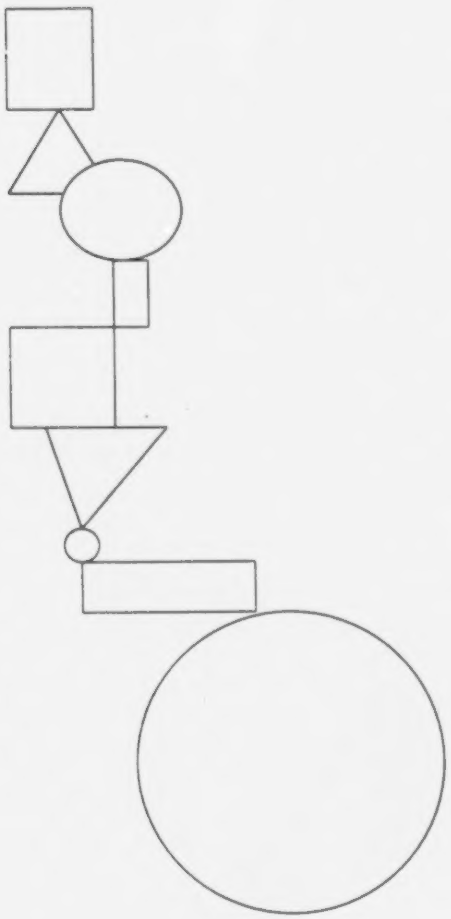
VI. The trainer will distribute the telephone message pads obtained from the company supply room. The trainees will complete the exercise, Who's Calling?

Evaluation: The trainer will evaluate each trainee visually as he/she completes the exercise, Who's Calling.

Extension: The trainees will take a telephone message for someone at home.

Squares, Rectangles, Triangles, and All the Angles

Draw the following diagram.



Constructive Feedback

Giving Feedback

- Be descriptive.
- Avoid using labels.
- Speak for yourself.
- Don't be judgmental.
- Talk first about yourself.
- Phrase the issue as a statement, not a question.
- Base feedback on things you know for certain - facts.
- Help people hear and accept positive feedback.

Receiving Feedback

Breathe.

Listen carefully. (Try not to interrupt)

Ask questions for clarity.

Acknowledge the feedback. (Rephrase)

Acknowledge the valid points.

Take time to sort out what you heard.

Project Future
Competency Area 1.0: Language Skills

Competency Number 1.2 Learn and Use Plastics Vocabulary

Lesson Number 1.2.1: Understand and Pronounce Terminology Commonly Used in Plastics Production--General Employment Terms.

Lesson Objective: Given a list of general employment terms commonly used in the plastics industry, the trainee will be able to pronounce each term correctly and will be able to correctly complete 10 out of 15 sentences by choosing the correct terms from the list.

Prerequisite Skill: The trainee will be able to respond orally to questions asked by the trainer.

Literacy Skills: The trainee will be able to read plastics vocabulary from a list.
The trainee will identify and underline root words on a vocabulary list.
The trainee will be able to complete sentences begun by the trainer orally and in writing.
The trainee will be able to accurately copy terms from a list.
The trainee will be able to use a dictionary to locate the meanings of words, the correct spelling of words, and the parts of speech of words.
The trainee will be able to correctly use words from a list in a sentence after locating the meaning in a dictionary.

Presentation:

I. Trainer will point to the terms on the Plastics Survival Vocabulary List--General Employment one at a time while the trainee reads the words. The trainer will correct pronunciation when necessary.

II. After the trainee has demonstrated correct pronunciation of all the terms, the trainer will work with the group to determine definitions of random terms on the board. Have the trainees check their definitions against the definitions listed on the Glossary list. Explain that this is the first of several vocabulary lessons. After the trainee has completed all the vocabulary lessons, he/she will have a glossary of commonly used plastics terms. This glossary will be valuable on the job. Trainees should add to the list each time they hear a new term.

III. The trainer will explain that one of the quickest way to learn a new word is to *decode* it. To decode a word means to 'reason out' what the word means by using what you already know. There are several ways to decode a word. One of these ways is to find the **root** of the word so that you can look up the word in a dictionary. Root words also aid in acquiring spelling skills.

IV. The trainer will demonstrate the skill by writing several words on the board and underlining the root word. Using the Plastics Survival Vocabulary List, General Employment Terms, the trainees will practice the skill by underlining the root words.

V. The trainer will divide the trainees into pairs and distribute dictionaries to the pairs. Using the dictionary, the trainees will complete the exercise--Getting to the Root of the Problem. NOTE: The trainer must demonstrate the use of a dictionary. (Alphabetical order, guide words, pronunciation guides, etc.)

Evaluation: Trainees will complete the Exercise, Understanding Important Employment Terms.

Extension Activity:

Using the insurance section of the company's benefit package, the trainee will underscore any terms he/she does not fully understand. The trainee will circle the root words and look up the root words in a dictionary. The trainee will then re-read the sentence from the insurance document and explain the sentence's meaning to a partner or to the trainer.

Plastics Survival Vocabulary
A Glossary of Terms

You will need to know the following list of words in order to succeed in the plastics industry. Read them over; practice reading them to a friend or co-worker. Be sure that you can define them.

General Employment Terms

Boss

Company

Employee

Employer

Enter

Exit

Foreman or Foreperson

Human Resources Department

Office

Package Inspector (PI)

Personnel

Quality Control Inspector (QC)

Shift

Staff

Supervisor

Time Clock

Timecard

Tools

Union

Worker

Working Shift

Plastics Survival Vocabulary

A Glossary of Terms

You will need to know the following list of words in order to succeed in the plastics industry. Read over them, practice reading them to a friend or co-worker. Be sure that you can define them.

General Employment Terms

Boss - Another word for supervisor

Company - A business

Employee - A person who works for another person or a company in return for compensation (pay)

Employer - A person or company who hires someone to do work

Enter - To go into

Exit - To leave

Foreman or Foreperson - A supervisor that has charge of a group of workers. In most cases supervisor, boss, and foreman/foreperson are used interchangeably (in place of each other).

Human Resources Department - The department within a company that deals with hiring employees, giving them their benefits, and seeing that all policies pertaining to employees are carried out.

Office - A place (a room or cubicle) in which business, clerical, or professional activities are conducted. Some offices include the manager's office, the foreperson's office, and the personnel manager's office.

Package Inspector (PI) - The employee whose job it is to examine all boxes to be sure that each is filled correctly and properly labeled.

Personnel - A group of workers within a company

Quality Control Inspector (QC) - The employee whose job it is to examine all parts manufactured, carefully and critically, for defects.

Shift - A group of workers on duty at the same time

Staff - A group of workers within a company

Supervisor - The person who directs and inspects your performance on the job

Time clock - A clock that records the arrival and departure times of employees, usually by punching time cards or by running an electronic card through a slot on the clock.

Timecard - A card maintained by an employee or stamped by a time clock, recording the employee's arrival and departure times each day. Many companies now use an electronic card which is slid through a slot on the time clock. The time clock electronically records the entry.

Tools - Pieces of equipment you need to use in order to complete a job

Union - A group of workers organized to work for changes within a specific industry. Dues are usually collected from members in order to finance union activities.

Worker - Another word for employee

Working shift - The assigned period for an employee to work. For example, first shift is from 7:00 a.m.to 3:00 p.m.

Getting to the Root of the Problem

Using a dictionary is a very important skill. The dictionary:

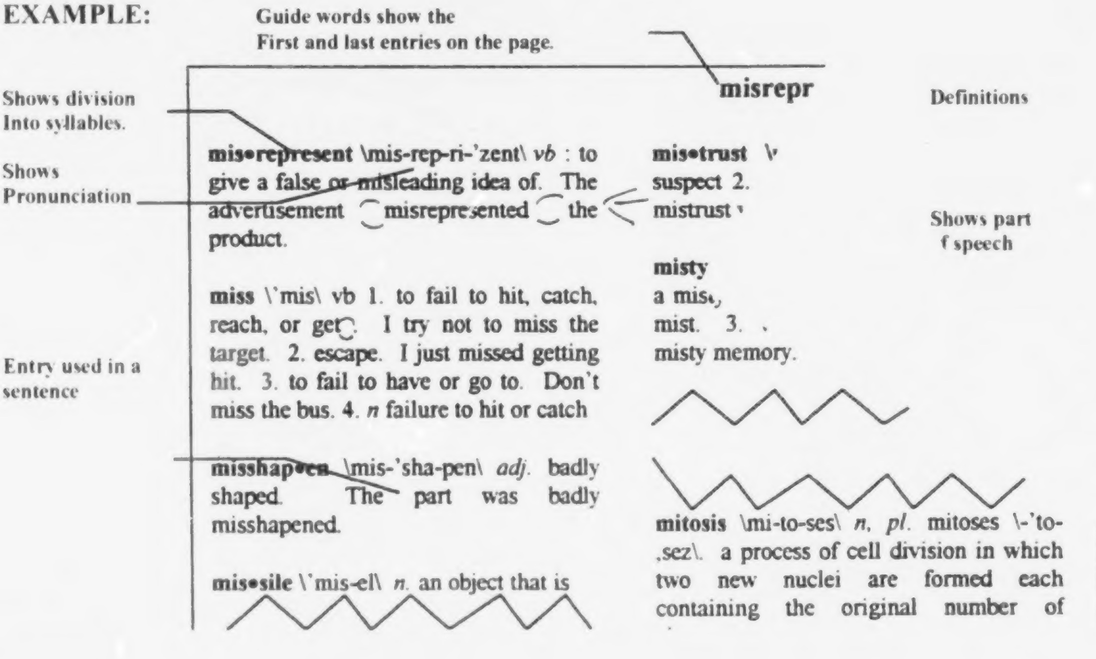
- **Can help you to understand the meaning of a word that is new to you.**
- **Can help you to correctly spell a word that you already know the meaning of.**
- **Gives you all the meanings of a word that has more than one meaning.**
- **Tells you how to pronounce a word.**
- **Gives you that part of speech of the word (whether it is a noun, a verb, an adjective, an adverb, a preposition, etc.)**

A dictionary may also use a word in a sentence so that you can see how it is correctly used. This helps you to understand the meaning more clearly. A word listed in the dictionary is called an *entry.*

A dictionary may give synonyms and antonyms of words. Synonyms are words that mean the same or nearly the same thing as the entry word; for example, *angry* and *mad.* Antonyms are words that mean the opposite of the entry word; for example, *sad* and *happy.*

Dictionary entries are listed in alphabetical order. Guide-words, also called key words, help you locate a word. They are at the top of the page. Guide-words give the first and last entries on a page. You decide whether the entry you want is between the guide-words. Instead of two guide-words to a page, some dictionaries use on. The guide on the page to your left is the first entry on that page. The guide- word on the page to your right is the last entry on that page.

EXAMPLE:



mis•represent \mis-rep-ri-'zent\ *vb* : to give a false or misleading idea of. The advertisement misrepresented the product.

miss \'mis\ vb 1. to fail to hit, catch, reach, or get. I try not to miss the target. 2. escape. I just missed getting hit. 3. to fail to have or go to. Don't miss the bus. 4. *n* failure to hit or catch

misshapen \mis-'sha-pen\ *adj.* badly shaped. The part was badly misshapened.

mis•sile \'mis-el\ *n.* an object that is

mis•trust \ suspect 2. mistrust

misty a mis mist. 3. misty memory.

mitosis \mi-to-ses\ *n, pl.* mitoses \-'to-,sez\. a process of cell division in which two new nuclei are formed each containing the original number of

BEST COPY AVAILABLE

Understanding General Employment Terms

1. Some people refer to a boss as a ____________________.
2. A person who works for a company in return for a salary is an ____________________.
3. When Jack comes into a room, he ____________________ it.
4. When Jack leaves the room, he ____________________ it.
5. The supervisor that has charge of a group of workers may be called a ____________________.
6. The department of a company that deals with hiring employees is the ____________________ Department.
7. The ____________________ is the employee whose job it is to examine all manufactured parts for defects.
8. A group of workers who is on duty at the same time is called a ____________________.
9. The ____________________ records the arrival and departure of employees.
10. The pieces of equipment you need to use in order to complete a job is called ____________________.
11. The ____________________ is the assigned period for an employee to work.
12. The employee whose job it is to examine all boxes to be sure that each is filled correctly and is properly labeled is called the ____________________.
13. A ____________________ is maintained by an employee or is stamped by a time clock recording the employee's work hours.
14. Another word for an employee is a ____________________.
15. Another name for a company is a ____________________.

Understanding General Employment Terms

1. Some people refer to a boss as a __*supervisor*__________________.

2. A person who works for a company in return for a salary is an
__*employee or worker*__________________.

3. When Jack comes into a room, he ___*enters*__________________ it.

4. When Jack leaves the room, he _____*leaves*_________________ it.

5. The supervisor that has charge of a group of workers may be called a
__*foreperson*__________________.

6. The department of a company that deals with hiring employees is the
__*Human Ressource*s________________ Department.

7. The __*Quality Control Inspector*___ is the employee whose job it is to examine all manufactured parts for defects.

8. A group of workers who is on duty at the same time is called a _*shift*_________.

9. The _*time clock*__________ records the arrival and departure of employees.

10. The pieces of equipment you need to use in order to complete a job is called
____*tools*_________________.

11. The ___*working shift*_____ is the assigned period for an employee to work.

12. The employee whose job it is to examine all boxes to be sure that each is filled correctly and is properly labeled is called the ___*Package Inspector*____.

13. A __*timecard*_________________ is maintained by an employee or is stamped by a time clock recording the employee's work hours.

14. Another word for an employee is a __*worker*________________.

15. Another name for a company is a ___*business*___________________.

Using Guide Words

The second skill you must master, in order to use the dictionary effectively, is to be able to categorize alphabetized words between guide-words.

Practice this skill by placing the following words under the appropriate guide-words:

Word List:

Plaster
Supplement
Borsch
Plastid
Supersede

supplicate
plastic
supply
suppose
bottom

borer
born
plate
botany
plateful

Guide Words:

Plantagenet/Platform	Supernatural/Supposition	Boredom/Botulism

Practice Using the Dictionary

Use the guidewords to look up the word *supervisor.*

How many definitions are there for the word? ____________________

What part(s) of speech is the word? ____________________

Use the word in a sentence of your own. ____________________

Use the guidewords to look up the word *boss.*

How many definitions are there for the word? ____________________

What part (s) of speech is the word? ____________________

Use the word in a sentence of your own. __________________________

Use the guidewords to look up the word *employee.*

How many definitions are there for the word? ____________________

What part(s) of speech is the word? ____________________

Use the word in a sentence of your own. ____________________

Use the guidewords to look up the word *personnel.*

How many definitions are there for the word? ____________________

What part(s) of speech is the word? ____________________

Use the word in a sentence of your own. ____________________

____

Practice Locating Words in the Dictionary

Alphabetical Order

One of the first things you must know, in order to use the dictionary well, is how to put words in alphabetical order. Practice this important skill by placing the following words in alphabetical order.

machinery ______________________________

machine ______________________________

operator ______________________________

part ______________________________

plasticate ______________________________

screw ______________________________

rotary ______________________________

mechanics ______________________________

safety ______________________________

safe ______________________________

Project Future
Competency Area 1.0: Language Skills

Competency Number 1.2: Learn and Use Plastics Vocabulary

Lesson Number 1.2.2: Understand and Pronounce Terminology Commonly Used in Plastics Production--Safety Words

Lesson Objective: Given a list of words commonly associated with safety in the plastics industry, the trainee will be able to pronounce each term correctly and will be able to answer 20 out of 25 multiple-choice questions.

Prerequisite Skills: The trainee will be able to respond orally to questions asked by the trainer.
The trainee will be able to read sentences.

Literacy Skills: The trainee will be able to read plastics vocabulary from a list.
The trainee will be able to identify and underline prefixes in words on a vocabulary list.
The trainee will be able to add prefixes to words and determine the new meaning of the word.
The trainee will be able to complete sentences begun by the trainer both orally and in writing.

Presentation:

I. Trainer will point to the terms on the list, one at a time, while the trainee reads the words. The trainer will correct pronunciation when necessary.

II. After the trainee has demonstrated correct pronunciation of all the terms, the trainer will work with the group to determine definitions of random terms on the board. Have the trainees check their definitions against the definitions listed on the Glossary list. Explain that this is the second of several vocabulary lessons. The trainees should add this list of definitions to their glossary.

III. The trainer will explain that another method of decoding a word is to break off the prefixes placed at the front of a word to change its meaning. Using the board and the handout, Common Prefixes, the trainer will demonstrate some common prefixes and their meanings. The trainer should give examples of words whose meanings are changed after the addition of a prefix; for example, incomplete and dissatisfied.

IV. The trainees will complete the exercise, Exercise in Adding Prefixes.

Evaluation: Trainees will complete the exercise, Understanding Safety Terms.

Extension: Trainees read a newspaper or magazine article about personal health or safety and circle as many words that contain prefixes as possible.

Safety Terms

Catastrophe

Catalysts

Caustic

Chemicals

Combustible

Ear Plugs

Explosion

Flammable

Flash Point

Gloves

Hard Hat

Hazard

Incident Report

Interlocking Safety Devices

Lock Out/Tag Out

Material Data Safety Sheet (MSDS)

Mechanical Safety Devices

OSHA

Physical safety devices

Precaution

Reactivity

Respirator

Right-to-Know-Laws

Safety Glasses

Velocity

Vent

Volatile

Safety Terms

Catastrophe - A great disaster, such as a fire

Catalysts - Chemicals that cause a chemical reaction

Caustic - Capable of burning, corroding (rusting), dissolving, or otherwise being eaten away by chemical action.

Chemicals - Substances which are produced by chemistry and are used in chemical actions. These may be either solids or liquids. Cleansers, and oiling agents are examples of chemicals.

Combustible - Capable of being burned

Ear Plugs - Devices worn to protect the ears from intense noise. There are two popular types of these devices. One type is the plug that fits directly into the ear. The other looks like a headset and covers the entire outside of the ear.

Explosion - A violent and noisy burst, usually producing heat and light

Flammable - Easily ignited and quick-burning

Flash Point - The lowest temperature at which vapors above a volatile combustible substance ignite in air when exposed to flame

Gloves - Cotton gloves are worn to protect employee's hands from the severe heat that is generated by the hot parts as they drop from the molding machine. Rubber gloves are worn to protect the employee's hands from caustic materials.

Hard Hat - Hard plastic protective hat worn in areas, such as a warehouse, where there is danger of falling objects

Hazard - Source of danger such as a flammable chemical

Incident Report - Report to be filed when an accident has occurred

Interlocking Safety Devices - Electrical, hydraulic, or pneumatic devices built into the machine that will prevent certain machine operations when safety conditions have not been met. These are present to prevent injury to the employees. Examples where such devices can be found include the purge guard, the front safety gate, the rear safety gate, and the top safety gate.

Lock Out/Tag Out – A device placed on an electrical cord or switch and secured into place with a padlock on the molding machine. The machine is usually tagged "Machine Not To Be Used." This is done to prevent unexpected operation of the machine during major repairs, set-up, or cleanup.

Material Data Safety Sheet (MSDS) - The material safety data sheet is required by OSHA. It is a document created by chemical or material manufacturers to explain the hazards which can occur when dealing with chemicals. It also explains how the chemical should be used, handled, and stored to prevent bodily harm.

Mechanical Safety Devices - Mechanical devices that prevent the clamp and/or other moving parts from operating when safety conditions are not met. One example is the drop bar. It prevents the moving platen from closing when the safety gate is open.

OSHA -Occupational **S**afety and **H**ealth **A**dministration. OSHA is a governmental agency that makes sure certain safety laws and practices are carried out by companies.

Physical Safety Devices - Physical barriers and/or warning signs that protect employees from moving parts or hot areas. Examples of these include heater band shields, guards around the top and bottom of the clamping unit, guards enclosing moving parts of injection unit, and color coded signs and/or symbols indicating safety hazards.

Precaution - A measure taken beforehand to prevent harm or to secure a good outcome.

Reactivity - The ability to undergo a chemical change

Respirator - A screen-like device worn over the nose and mouth to protect the nose, throat, and lungs. These are only required in specialized applications.

Right-to-Know Laws - Federal laws that require companies to post warnings concerning hazardous chemicals or materials present in the workplace.

Safety Glasses - Protective plastic lens glasses worn to protect the employee's eyes. Even if these are not required, they should be used.

Velocity - Rate of speed

Vent - To allow air to escape and/or enter

Volatile - Readily becoming a vapor at a relatively low temperature

COMMON PREFIXES

ex

de

dis

in

mis

non

inter

intra

pro

pro

re

sub

trans

un

im

com

QUESTIONS

Where is the prefix placed in a word?

Can you think of some words with prefixes?

Exercise in Adding Prefixes

Form new words by adding prefixes to the root words below. You may wish to use the list of prefixes given to you class, or you may use others.

1. Bine ____________________
2. Lock ____________________
3. Caution ____________________
4. Active ____________________
5. Grind ____________________
6. Smoke ____________________
7. Mold ____________________
8. Scrape ____________________
9. Grease ____________________
10. Stress ____________________
11. Grease ____________________
12. Late ____________________
13. Hinge ____________________
14. Move ____________________
15. Port ____________________
16. Latch ____________________
17. Sent ____________________
18. Vision ____________________
19. Proper ____________________
20. Design ____________________

Understanding Safety Terms

Use the vocabulary list and the list of definitions you were given in the class to complete this exercise. Circle the letter of the choice which best completes the question. When you have finished, score your paper using the master sheet provided by your trainer. You should answer 20 of the items correctly.

1. A fire would be seen as a
   a. lock out.
   b. hopper.
   c. catastrophe.

2. The governmental organization that makes sure safety laws and practices are followed by companies is called
   a. OSHA.
   b. AMA.
   c. STARR.

3. Safety glasses are:
   a. protective plastic lens glasses that protect an employee's eyes.
   b. hard glasses used to protect liquid in the production area.
   c. tools used for the maintenance of machine gates.

4. _____________ allow air to escape or enter an area.
   a. Velocities
   b. Vacancies
   c. Vents

5. The rate of speed of an object is called its _____________.
   a. volatility
   b. velocity
   c. ventricity

6. When a measure is taken beforehand too prevent harm or to secure a good outcome, a _____________ has been taken.
   a. precursor
   b. perversity
   c. precaution

7. A _______________ is worn where there is danger of falling objects.
   a. cotton glove
   b. uniform
   c. hard hat

8. Federal laws that require companies to post warnings concerning hazardous chemicals or materials present in the work place are called ______________:
a. Chemical Safety Laws.
b. Right-to-Know Laws
c. Safety Rights Laws

9. When someone tells you a material is volatile, he/she means that:
a. the material will become solid at a fairly low temperature.
b. The material in inexpensive.
c. The material will become a vapor at a fairly low temperature.

10. Cleansers and oiling agents are examples of ________________.
a. Chemicals
b. Cooling agents
c. Explosives

11. Reports that are filed after an accident are often called:
a. Lock-out reports.
b. Flash points.
c. Incident reports.

12. The _________________ is the lowest temperature at which vapors above a volatile combustible substance will ignite in the air when exposed to a flame.
a. flash point
b. firing point
c. freezing point

13. Interlocking safety devices are built into a machine to:
a. Prevent injury to employees.
b. Prevent certain operations when safety conditions have not been met.
c. Both of the above.

14. During a _________________ a devise is placed on an electrical cord or switch and secured into place with a padlock on the molding machine. A sign stating "Machine Not to be Used" is usually placed on the machine.
a. power outage
b. OSHA visit
c. lock out tag

15. A ______________ is a screen-like device worn over the nose and mouth.
a. mouth guard
b. respirator
c. ski mask

16. Heater band shields and guards enclosing moving parts of the injection unit are examples of ________________.
a. medical safety devices
b. somatic safety devices
c. physical safety devices

17. ________________ are mechanical devices that prevent the clamp and/or other moving parts of the machine form operation when safety conditions are not met.
a. Precautionary Safety devices
b. Mechanical safety devices
c. Medical safety devices

18. A ________________ is required by OSHA. It is a document created by chemical or material manufacturers to explain the hazards that can occur when dealing with chemicals.
a. Material Safety Data Sheet
b. Mineral Disclosure Sheet
c. Medical Alerts Warning Sheet

19. The drop bar is one example of a ______________ safety device.
a. physical
b. mechanical
c. interlocking

20. A material that can burn, rust, dissolve, or eat an object away by chemical action is called ________________.
a. callused
b. caustic
c. pneumatic

21. ______________ are protective devices worn to protect the ears form intense noise.
a. Hard hats
b. Safety glasses
c. Ear plugs

22. ________________ should be worn in a warehouse to protect the employee's heads from being injured by a falling object.
a. Safety glasses
b. Hard hats
c. Ear plugs

23. _____________ gloves are worn to protect an employee's hands from caustic materials.
a. Plastic
b. Cotton
c. Rubber

24. If your supervisor cautions you that the material you are working with is combustible, he/she means that:
a. the material is very brittle
b. the material has a high density
c. the material can catch fire

25. A violent and noisy burst that produces heat and light is most likely a(n):
a. explosion.
b. catalyst.
c. expulsion.

Project Future
Competency Area 1.0: Language Skills

Competency Number 1.2: Learn and Use Plastics Vocabulary

Lesson Number 1.2.3: Understand and Pronounce Terminology Commonly Used in Plastics Production, Molding Process Terms

Lesson Objective: Given a list of words commonly associated with the molding process, the trainee will be able to pronounce each term and will be able to correctly match 20 out of 30 terms with definitions.

Prerequisite Skills: The trainee will be able to read simple sentences.
The trainee will be able to respond orally to questions asked by the trainer.
The trainee will be able to read sentences.

Literacy Skills: The trainee will be able to read plastics vocabulary from a list.
The trainee will be able to identify and underline suffixes in words on a vocabulary list.
The trainee will be able to add suffixes to words and determine the new meaning of the word.
The trainee will be able to complete sentences begun by the rainer orally and in writing.

Presentation:

I. Trainer will point to the terms on the list one at a time while the trainee reads the words. The trainer will correct pronunciation when necessary. Explain that this is the third of several vocabulary lessons. The trainees should add this list of definitions to their glossary.

II. After the trainees have demonstrated correct pronunciation of all the terms,take the trainees through the plant. Have them use the scavenger hunt forms to locate the 20 terms listed.

III. The trainer will explain that another method of decoding a word is to break off the suffixes placed at the end of a word to change its meaning. Using the board and the handout, Common Suffixes, the trainer will demonstrate some common suffixes and their meanings. The trainer should give examples of words whose meanings are changed after the addition of a suffix.

Evaluation: Trainees will complete the exercise, Understanding Molding Process Terms.

Extension: Trainees will circle as many words containing suffixes as possible when reading an article about career enhancement from a plastic's magazine.

SCAVENGER HUNT

Item to Find	Location Found
Call Bell	
Dryer	
Fork Lift	
Grinder	
Mold	
Press	
Regrind	
Resin	
Runner	
Barrel	
Water Bath	
Hopper	
Gaylord	
Gate	

Molding Process Terms

Acronym

Amorphous Materials

Barrel

Call Bell or Buzzer

Cavities and Cores

Conveyor

Desiccant Dehumidifying Dryer

Device

Dew Point

Dryer

Drying temperature

Eject

Ejector Pins

Ejector Plate

Electrical

Feed Throat

Fork Lift

Gate

Gaylord

Grinder

High Density Materials

Hopper

Hydraulic

Hygroscopic Materials

Injection Molding Machine

Low-Density Materials

Mold Temperature

Mold

Morphology

Nozzle

Opacity

PA System

Parting Line

Parts

Pilot Run

Pneumatic

Polymer

Press

Processing Melt Temperature Range

Processing Time

Properties

Prototype

Purge

Regrind

Resin

Runner

Screw

Semi-crystalline Polymers

Sprue

Thermoplastic Resins (TP)

Thermoset Resins (TS)

Virgin materials

Wall

Waterlines

Viscosity

Gaylord - Term used to describe a weight of material equal to approximately 1000 pounds.

Grinder - Large machine with blades that grinds defective parts and runners into reusable plastic pellets.

High Density Materials - Materials with heavier more closely packed molecules. These materials form a thicker-walled part when cooled.

Hopper - Part of the injection molding machine that delivers material to the screw by way of the feed throat.

Hydraulic - Operated by a fluid, such as oil or water, under pressure.

Hygroscopic Materials - Materials that absorb water

Injection Molding Machine - A large machine that uses electrical, hydraulic, and pneumatic devices to change a resin mixture into a molded plastic part.

Low Density Materials - Materials that have lighter more loosely packed molecules. These materials form a thinner-walled part.

Mold Temperature - The temperature that must be maintained so the material will mold properly.

Mold: *As a noun* - A hollow form for shaping a plastic substance. *As a verb* - to use a mold to create parts.

Morphology - The molecular structure. There are two molecular structures of plastics polymers - semi-crystalline and amorphous.

Nozzle - Part of the injection molding machine. Material exits the nozzle as it is injected into the mold.

Opacity - The amount of light an object will allow to pass through.

PA System - Public Address System. System that allows staff members to make an announcement that will be heard by everyone in a large area.

Parting Line - Line where the two mold halves meet.

Parts - Individual pieces produced during the molding process

Pilot Run - A test run of the production system. A pilot run may be done to try out a new system to see how well it works or to debug (correct) a system already in place.

Pneumatic - Operated by compressed air

Polymer - Natural or synthetic compound made of molecules that contain carbon.

Press – A machine that uses pressure. In plastics, the terms injection molding machine and injection molding press are used interchangeably.

Processing Melt Temperature Range - The range of temperatures to which a resin mixture must be heated in order to liquify enough to run into the mold.

Processing Time - The amount of time required for the completion (from beginning to end) of the steps in the molding process.

Properties - The qualities of a material such as hardness, opacity, strength, and so forth. Properties tell the engineer how the material will perform or behave during use.

Prototype - A working model. Prototypes are used to check the operation of the final product.

Purge - To forcefully remove all old resin from the internal parts of the press.

Regrind - The product of the grinder. Plastic that has once been molded but has been ground into reusable pellets.

Resin - Raw plastics' materials that are used to form plastics' parts. The resin is mixed with fillers, stabilizers, pigments, and other components and placed in the machine hopper. Some of the most common resins include: poly-vinyl, polystyrene, and polyethylene, polyesters, nylons, epoxies, and silicones.

Runner - The part of the mold that brings material from the sprue to the gate. This term is also used to refer to the hardened plastic that fills this area of the mold and is ejected from the mold with the parts during production. The runner of plastic is often put in the grinder to be reground into reusable pellets.

Screw - Part of the injection molding machine that pushes and melts material on its way to the mold.

Semi-Crystalline Polymers – Plastics' materials that have molecules that align themselves in a somewhat orderly pattern. They do not form perfect crystals.

Sprue - The channel that brings material from the nozzle of the press to the runner of the mold.

Thermoplastic Resins (TP) - Resins that repeatedly soften when heated, and solidify when cooled. These are the most frequently used materials in the injection molding process.

Thermoset Resins (TS) - Resins that undergo a chemical change when sufficiently heated, to become a permanently infusible solid. These cannot be re-melted after processing. Some thermosets can be injection molded with special equipment.

Virgin Materials - Materials that have not been altered or changed from their original state

Wall - The outside edge of a part

Waterlines - Lines that remove heat from the plastic and allow it to harden.

Viscosity - Thickness of the material

Molding Process Terms

Acronym – A shortened form of a name, usually made up of letters or initials found in the full length of the name.

Amorphous Materials - Polymers made up of molecules arranged in a random pattern

Barrel - The part of the injection-molding machine which controls heat and houses the screw that pushes the plastic mixture toward the mold.

Call Bell or Buzzer - Bell or buzzer located on or near the injection molding press which allows the operator to signal for assistance.

Cavities and Cores - Hollow areas within the mold that form the outside of the part. Molten plastic fills these cavities that harden into parts. Molds may have one cavity or 30 cavities. When a mold is working correctly, each cavity will eject a part each time the mold opens. The core of a mold is similar to the cavity except that it has raised portions that fit into each cavity. The core forms the inside of the part.

Conveyor - A mechanical machine with a continuously moving belt that transports parts, materials, or boxes from one place to another.

Desiccant Dehumidifying Dryer - A dryer that uses a chemical substance to pull water out of the molding mixture

Device - A plan or a machine made for a specific purpose

Dew Point - The temperature at which the moisture in the air in the dryer begins to condense.

Dryer - A piece of equipment used for removing moisture from molding mixtures.

Drying Temperature - The temperature that the dryer must maintain in order for moisture to be removed from a material.

Eject - To forcefully drop parts from the mold

Ejector Pins - Pins used to eject the part from the mold.

Ejector Plate - Pushes the ejector pins forward for part removal.

Electrical - Operated by electric current as a source of power.

Feed Throat - Takes the material from the hopper and pre-heats it before sending it into the barrel.

Fork Lift - A small industrial vehicle with a power-operated pronged platform that can be raised and lowered for insertion under a load to lift and carry.

Gate- The part of the mold that takes the material from the runner and directs the flow into the cavity. Gate is also used to describe the area on the part where the gate ended. This area may need to be trimmed of excess plastic.

COMMON SUFFIXES

ible
able
er
est
ful
ing
ish
ure
ion

ist
less
ness
ment
ship
tion
ation
ity
ian

QUESTIONS:

- ☐ Where is a suffix places in a word?
- ☐ Can you think of some words with suffixes?

Exercise in Adding Suffixes

Form new words by adding suffixes to the root words below. You may wish to use the list of prefixes given to you in class or you may use others.

1. inject ____________________

2. water ____________________

3. moist ____________________

4. active ____________________

5. combust ____________________

6. smoke ____________________

7. mold ____________________

8. obstruct ____________________

9. temperate ____________________

10. stress ____________________

11. tract ____________________

12. thick ____________________

13. adjust ____________________

14. eject ____________________

15. port ____________________

16. specific ____________________

17. ship ____________________

18. connect ____________________

19. adjust ____________________

20. design ____________________

Understanding Molding Process Terms

Use the vocabulary list and the list of definitions you were given in class to complete this exercise. Place the letter of the definition which best fits the term on the blank line at the left of the term. When you have finished, score your paper using the master sheet provided by your trainer. You should answer 20 of the items correctly.

_____ 1. Regrind

_____ 2. Mold Temperature

_____ 3. Polymer

_____ 4. Cavities

_____ 5. Runner

_____ 6. Sprue

_____ 7. Grinder

_____ 8. Eject

_____ 9. Call Bell

_____10. PA System

_____11. Fork Lift

_____12. Gate

A. To forcefully drop parts from the mold

B. Hollow areas within the mold that form the outside of the part

C. Plastic that has once been molded but has been ground into reusable pellets

D. A working model

E. The line where two mold halves meet

F. Bell or buzzer located on or near the press which allows the operator to signal for assistance

G. Operated by compressed air

H. A small industrial vehicle with a pronged platform that can be raised and lowered for insertion under a load to lift or to carry

I. Similar to a cavity except that it has raised portions which fit into each cavity

J. The part of the mold that takes the material from the runner and directs the flow into the cavity

K. Operated by a fluid, such as water or oil, under pressure

L. The temperature that the dryer must maintain in order for moisture to be removed from a material

_____13. Dryer

_____14. Cores

_____15. Pneumatic

_____16. Wall

_____17. Hydraulic

_____18. Injection Molding Machine

_____19. Barrel

_____20. Prototype

_____21. Parting Line

_____22. Opacity

_____23. Thermoplastic Resins

_____24. Mold

M. The outside edge of a part

N. A large machine that uses energy to change a resin mixture into a molded plastic part

O. The part of the machine which controls heat and houses the screw

P. A piece of equipment used for removing moisture from molding mixtures

Q. The amount of light an object will allow to pass through

R. A hollow form for shaping a plastic substance

S. The temperature which must be maintained for the material to mold properly

T. A mechanical machine with a continuously moving belt that transports parts, materials, or boxes from one place to another

U. The qualities of a material such as hardness, opacity, strength, etc.

V. Resins that undergo a chemical change when heated, to become a permanently infusible solid. These cannot be remelted melted after processing

W. The channel that brings material from the nozzle of the press to the runner of the mold

X. Resins that repeatedly soften when heated and solidify when cooled. These can be remelted after processing

_____25. Properties

_____26. Virgin Materials

_____27. Thermoset Resins

_____28. Conveyor

_____29. Purge

_____30. Drying Temperature

Y. A large machine with blades that grinds defective parts and runners into reusable plastic pellet

Z. Natural or synthetic compound made of molecules that contain carbon

AA. System which allows staff members to make an announcement that can be heard by everyone in a large area

BB. The part of the mold that brings material from the sprue to the gate

CC. To forcefully remove all old resin from the internal parts of the press

DD. Materials that have not been altered or changed from their original state

Understanding Molding Process Terms

Use the vocabulary list and the list of definitions you were given in class to complete this exercise. Place the letter of the definition that best fits the term on the blank line at the left of the term. When you have finished, score your paper using the master sheet provided by your trainer. You should answer 20 of the items correctly.

A. To forcefully drop parts from the mold

B. Hollow areas within the mold that form the outside of the part

C. Plastic that has once been molded but has been ground into reusable pellets

D. A working model

E. The line where two mold halves meet

F. Bell or buzzer located on or near the press that allows the operator to signal for assistance

G. Operated by compressed air

H. A small industrial vehicle with a pronged platform that can be raised and lowered for insertion under a load to lift or to carry

I. Similar to a cavity except that it has raised portions that fit into each cavity

J. The part of the mold that takes the material from the runner and directs the flow into the cavity

K. Operated by a fluid, such as water or oil, under pressure

L. The temperature that the dryer must maintain in order for moisture to be removed from a material

M. The outside edge of a part

N. A large machine that uses energy to change a resin mixture into a molded plastic par

C 1. Regrind

S 2. Mold Temperature

Z 3. Polymer

B 4. Cavities

BB 5. Runner

W 6. Sprue

Y 7. Grinder

A 8. Eject

F 9. Call Bell

AA 10. PA System

H 11. Fork Lift

J 12. Gate

P 13. Dryer

I 14. Cores

O. The part of the machine that controls heat and houses the screw

P. A piece of equipment used for removing moisture from molding mixtures

Q. The amount of light an object will allow to pass through

R. A hollow form for shaping a plastic substance

S. The temperature that must be maintained for the material to mold properly

T. A mechanical machine with a continuously moving belt that transports parts, materials, or boxes from one place to another

U. The qualities of a material such as hardness, opacity, strength, etc.

V. Resins that undergo a chemical change when heated, to become a permanently infusible solid. These cannot be remelted after Processing

W. The channel that brings material from the nozzle of the press to the runner of the mold

X. Resins that repeatedly soften when heated and solidify when cooled. These can be remelted after processing

Y. A large machine with blades that grinds defective parts and runners into reusable plastic pellets

Z. Natural or Synthetic compound made of molecules that contain carbon

AA. System that allows staff members to make an announcement that can be heard by everyone in a large area

G 15. Pneumatic

M 16. Wall

K 17. Hydraulic

N 18. Injection Molding Machine

O 19. Barrel

D 20. Prototype

E 21. Parting Line

Q 22. Opacity

V 23. Thermoplastic Resins

R 24. Mold

U 25. Properties

DD 26. Virgin Materials

X 27. Thermoset Resins

BB. The part of the mold that brings material from the sprue to the gate

CC. To forcefully remove all old resin from the internal parts of the press

DD. Materials that have not been altered or changed from their original state

_____T_____ 28. Conveyor

_____CC_____ 29. Purge

_____L_____ 30. Drying Temperature

Project Future
Competency Area 1.0: Language Skills

Competency Number 1.2: Learn and Use Plastics Vocabulary

Lesson Number 1.2.4: Understand and Pronounce Terminology Commonly Used in Plastics Production, Quality Control Terms

Lesson Objective: Given a list of words commonly associated with the quality control process, the trainee will be able to pronounce each term and correctly identify the name of the defect in eight out of ten defective products. The trainee will also correctly complete 12 sentences to demonstrate understanding of quality control terminology.

Prerequisite Skills: The trainee will be able to read simple sentences.
The trainee will be able to respond orally to questions asked by the trainer.
The trainee will be able to read sentences.

Literacy Skills: The trainee will be able to read plastics vocabulary from a list.
The trainee will be able to recognize compound words.
The trainee will be able to combine root words to make compound words and explain the new meaning of the word.
The trainee will be able to complete sentences begun by the trainer orally and in writing.

Presentation:

I. Trainer will point to the terms on the list one at a time while the trainee reads the words. The trainer will correct pronunciation when necessary. Explain that this is the third of several vocabulary lessons. The trainees should add this list of definitions to their glossary.

II. The trainer will explain that another valuable tool for decoding words is to identify compound words. The trainer will demonstrate several words on the board as one trainee suggests part of a compound word and a second trainee completes the compound. The trainees complete the exercise, Making One Word Out of Two.

III. Before the lesson, the trainer will gather as many small tools and defective (non-passable) parts as possible from the production floor. For each defective part, the trainer will gather a passable part. The trainer will use these parts to allow the trainees to visualize the defects. After the trainees complete the pronunciation exercise, the trainer will use the tools and parts to illustrate the defects listed on the vocabulary list as defects.

Evaluation: The trainee will complete the exercise, Identifying Quality Control Problems and Tools. Ten of the defective products will be needed for this exercise.

Extension Activity: Trainees will write a three-paragraph essay about a quality control problem they have experienced with a product they have purchased. They will explain how the problem affected them and how the problem was resolved.

Quality Control Terms

Cleaner

Clip/Cut

Control

Customer

Cycle Times

Gate

First Shot or First Piece

Grind

Insert

Knife

Last Shot or Last Piece

Misses in Hot Stamp

Not Passable

Parts

Passable

Punch Holes

Quality Control

Quality Inspection Instruction Sheet

Quality

Red Tag

Rejects

Runner

Scrape

To Mill

Trim Sample

Trim

Visual Inspection

Water Bath

Defects Terms

Blister
Brittleness
Bubble
Bump
Color Specks
Cracks
Distortion
Flash
Flowlines
Grease
Pull
Short
Silver
Sink Marks
Specks
Splay
Streaks
Stress
Swirl
Warble
Warpage

Packaging Terms

Tape
Pack or Fill
Box
Container
Chip board or Dividers
Tissue Paper
Row

Layers

Label

Pallet/Skid

Quality Control Terms

Cleaner - Substance used to remove grease or soiled areas from parts

Clip/cut - To remove extra pieces of plastic from a part by using scissors, pliers, or other cutting tools.

Control - To verify by using a prearranged standard for comparison

Customer - Company paying for the order

Cycle Times - The number of times per minute that the mold opens up and ejects a part.

Gate - Area where plastic has been shot into the mold. This area may need to be trimmed of excess plastic.

First Shot or First Piece - This is the first piece produced. A first piece may be requested for the first time a mold is run, for the beginning of each shift, or after a major adjustment to the machine.

Grind - To use the grinding machine to chop defective parts and runners into small pieces that can be mixed back into resin to mold other parts.

Insert - An object that is put inside the mold during the molding process. An example would be a metal shaft that allows the part to be connected to another part.

Knife - Instrument used for trimming and smoothing parts

Last Piece or Last Shot - Similar to the first piece(s) sample. The last shot is the last piece(s) from the mold before shutdown. A last shot may also be requested before major repairs to the mold are undertaken.

Misses in Hot Stamp - Areas of the part that have not been completely stamped by the stamping machine.

Not passable - Variations in parts that are not acceptable to the customer

Parts - Individual pieces produced during the molding process

Passable - Variations in the part that are acceptable to the customer

Punch Holes - Use an awl or other tool to eliminate plastic from an area of a part

Quality Control - To verify the degree of excellence using a pre-arranged standard for comparison

Quality Inspection Instruction Sheet - Sheet that lists the quality standards expected by the customer

Quality - Degree or grade of excellence

Red Tag - Paper tags written during the quality control check that indicate that parts are to be held to be reevaluated before shipping.

Rejects - Parts that are not within the quality standards set by the customer.

Runner - Material contained in the channel of the mold. This is placed in the grinder to be reground and used again.

Scrape - To hold the knife blade at a sharp angle and pull it softly along the edge of the part. The blade should not be lifted as it would in cutting.

To Mill - To cut, shape, polish, or finish a part by using a machine which evenly reduces the size of a part.

Trim Sample - A sample of the part being produced that has all the areas that need to be trimmed marked. This sample is the standard--all pieces are to look exactly like it.

Trim - To remove excess plastic by using the knife or other sharp tool

Visual inspection - Inspect by eye to look for defects. Each part must pass a visual inspection before being boxed.

Water bath - A container of water used to cool parts

Defects Terms

Blister - Burned area of a part

Brittleness - Abnormal breaking or cracking of part

Bubble - Raised area on a part that flattens when touched

Bump - Raised area on a part that is hard and does not flex when touched

Color Specks - Small areas of unacceptable color within a part

Cracks - Areas of a part which are broken open

Distortion - Odd shaped areas of a part

Flash - Small bits of excessive plastic on the part around the parting lines

Flow Lines - Marks on part surface that indicate material flow

Grease - Grease from the machine that gets onto the part as it drops from the mold. These must be removed.

Pull - Areas of a part that appear to have been stretched.

Short - Also called short shot. The part is not completely filled out; there are areas of the part missing.

Silver - Silvery or white lines located on surface of the part

Sink Marks - Irregularly shaped depressed areas in the part

Specks - Pieces of contaminates in the part

Splay - Streaks located on the surface of the part

Streaks - Elongated areas of discoloration or differing texture on a part

Stress - Pulled or thinned areas within a part

Swirl - Discolored areas which swirl through areas of the part

Warble - Parts that have sunken areas

Warpage - Parts which are twisted due to unequal shrinkage

Packaging Terms

Tape -To seal a box using specific tapes

Pack or Fill - Place product in boxes in the way that is specified by the customer's instruction sheet

Box - Container for product. Most boxes are cardboard.

Container - Any box or other device used to transport products from the supplier (maker) to the customer.

Chip Board or Dividers - Cardboard pieces that are used to divide layers in a box.

Tissue Paper - Thin paper used to protect easily damaged parts

Row - Term used to define the way parts are place in a single layer of a box

Layers - Parts may be placed in multiple layers in a box

Label - Paper attached to the side of a box that describes the part and gives the part number and other important information. Labels are also used on the molding material.

Pallet/Skid - Large wooden box that is used as a base for several layers of boxes. The pallet allows multiple boxes to be transferred from one place to another easily,usually by forklift.

Making One Word Out of Two

Add a word from the second column to a word in the first column to form a new word. Select 5 of the new words and write a definition for them. The first one is done for you.

super	*supervisor*	light
card		man
flash		visor
flow		lift
fore		board
fork		lines
gay		book
hand		lock
note		age
pack		lord
pad		held
time		clock
water		lines

Identifying Quality Control Problems and Tools

Look at the numbered parts. Beside the number below, write the name of the defect. You will need to use the definitions of the terms or defects to assist you in determining the correct name for the defect.

1. ______________________________
2. ______________________________
3. ______________________________
4. ______________________________
5. ______________________________
6. ______________________________
7. ______________________________
8. ______________________________
9. ______________________________
10. ______________________________

1. You will need a sharp blade to ________________ the parts before packing them into the box.
2. Look at the __________________ in order to know how to properly trim the parts.
3. Hold the blade slightly sideways in order to ____________ the flash form the area.
4. The hold area is for the ______________ parts.
5. Parts that are not passable are said to be ________________.
6. The operator is to _______________ inspect each part before packing the parts.
7. The parts are to be packed two ____________ deep with a cardboard divider between each.
8. The _______________ is the first piece produced.

9. The _______________ is the last piece produced.

10. When you cut, shape, polish, or finish a part using a machine which evenly reduces the size of a part, you are said to _______________ the part

11. Elongated streaks of discoloration or differing texture on a part are called _______________.

12. A large wooden box used as a base for several layers of boxes is a __________________.

Project Future
Competency Area 1.0: Language Skills

Competency Number 1.2: Learn and Use Plastics Vocabulary

Lesson Number 1.2.5: Identify Parts of the Injection Molding Press

Lesson Objective: Given a picture of an injection molding press, the trainee will be able to identify the selected areas with percent accuracy by selecting words from a list.

Prerequisite Skills: The trainee will be able to read simple sentences
The trainee will be able to print and to copy words.

Literacy Skills: The trainee will be able to apply information from class work to daily job requirements.
The trainee will be able to use a glossary to find information.

Presentation:

I. The trainees will be given a picture of an injection molding machine with all parts labeled. The trainees will define the labeled parts by using the glossary they have used for the Injection Molding vocabulary lesson.

II. After the trainees complete the definitions, the trainer will take the trainees to an injection molding press and lead the trainees identifying the parts of the press and their purpose or use.

Evaluation: Trainees will complete the exercise: Identifying the Parts of an Injection Molding Machine.

Extension: Before class, the trainer will secure an under-the-hood diagram of an automobile. The trainer will make up three or four mechanical problems and write them on 5 x 7 cards (one for each team). Using the diagram of the car, the trainees will work together in teams to label the major parts of the car and to use the diagram to explain a mechanical problem that they wish to have repaired. They will explain this to the rest of the class.

Sections of the Injections Molding Machine

Three basic mechanical units work together in the Injection Molding Process. The injection-molding machine provides:

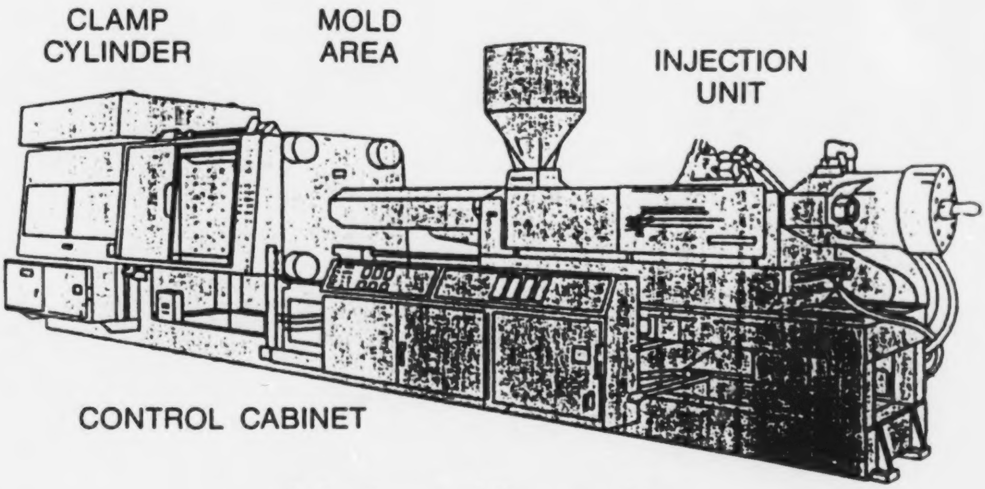
1. a mold clamping device.
2. an injection unit.
3. a removable mold.

The mold-clamping machine holds and opens and closes the mold. The clamping cylinder also opens the mold.

The injection unit softens the plastic molding materials for molding. Heat controls, called pryrometers, maintain the temperature automatically.

The mold is composed of several parts. These will be discussed in more detail in a later lesson.

The major parts of the machine are pictured below. A diagram that depicts, in more detail, the parts of the machine follows.



Injection molding machine

The Parts of an Injection Molding Machine

Clamping Unit

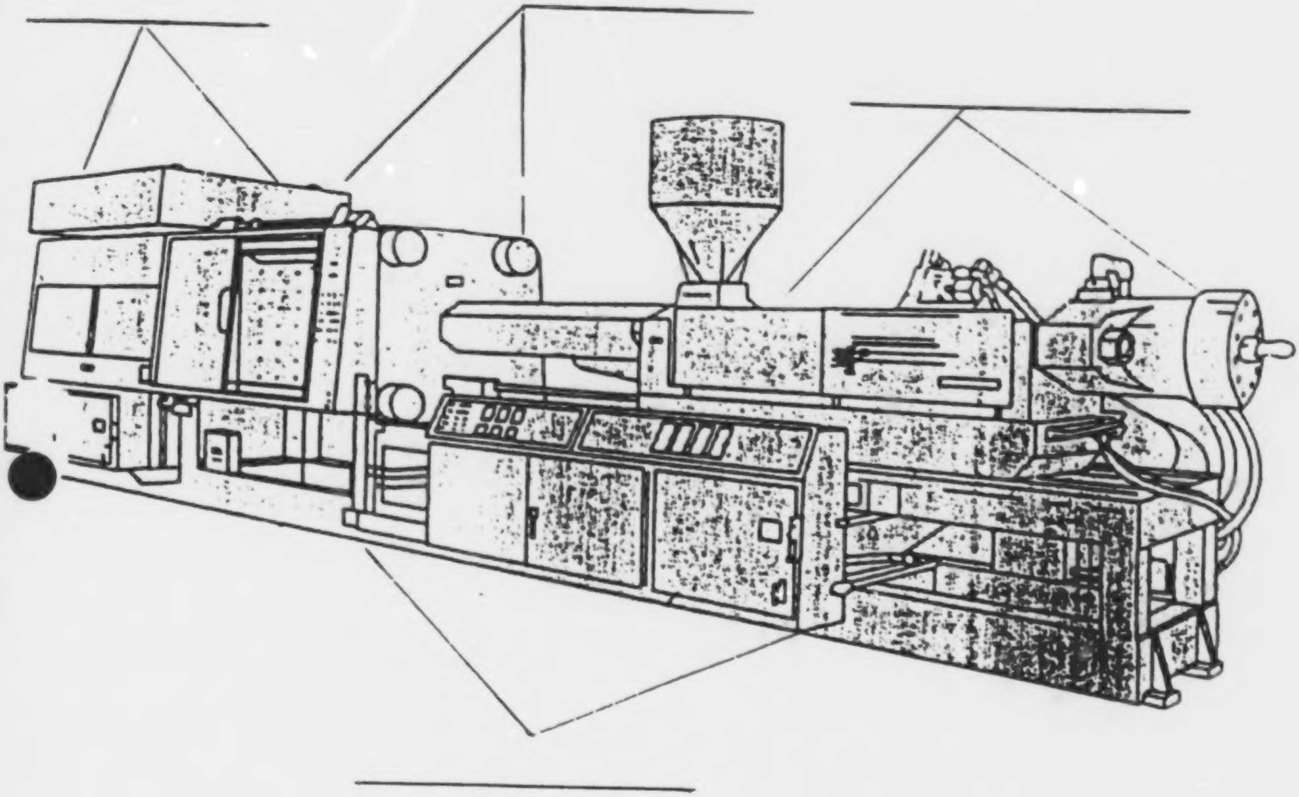
Clamping Cylinder - Provides hydraulic pressure to move and clamp the mold.
Movable Platen - The movable half of the mold in mounted to this and it contains the injector mechanism.
Ejection Mechanism - Provides a means for the part to eject from the mold.
Stationary Platen - Non-moveable half to which the stationary half of mold is mounted.
Tie Rod - Ties platens together.
Safety Gate - Separates operator from moving parts of the press.
Frame - Allows components to be attached to the machine
Electric Motor - Runs the hydraulic pump.
Hydraulic Pump - Used to build hydraulic pressure to operate the press.
Control Panel - Used to adjust and operate the machine.
Computer Screen - Used to set parameters.
Heat Exchanger - Controls oil temperatures.
Reservoir - Collects and stores hydraulic fluid for the hydraulic pump.

Injection Unit

Hopper - Holds material and delivers material to the screw by way of the feed throat.
Barrel - Houses the screw and controls the heat.
Heater Bands - Contributes approximately 30 percent of the energy to melt material.
Screw - Conveys and melts material (shear contributes to 70 percent of the melt).
Feed Section - Conveys and preheats material.
Compression/Transition Section - Melting, compression, degassing, and shearing occurs.
Metering Section - Measures material, homogenizes and mixes melt.
Non-Return Valve - Prevents back flow of material during injection and allows screw to be used as a plunger and extruder.
Nozzle - Material exits during injection and connects injection unit to mold.
Injection Cylinder - Provides hydraulic pressure to inject and extrude material.
Feed Throat - Connects hopper to barrel and prevents bridging of material.

Identifying the Parts of the Injection Molding Machine

Identify the parts of the machine shown below. Choose from the terms listed below the picture.



Injection Unit

Clamp Cylinder

Control Cabinet

Mold Area

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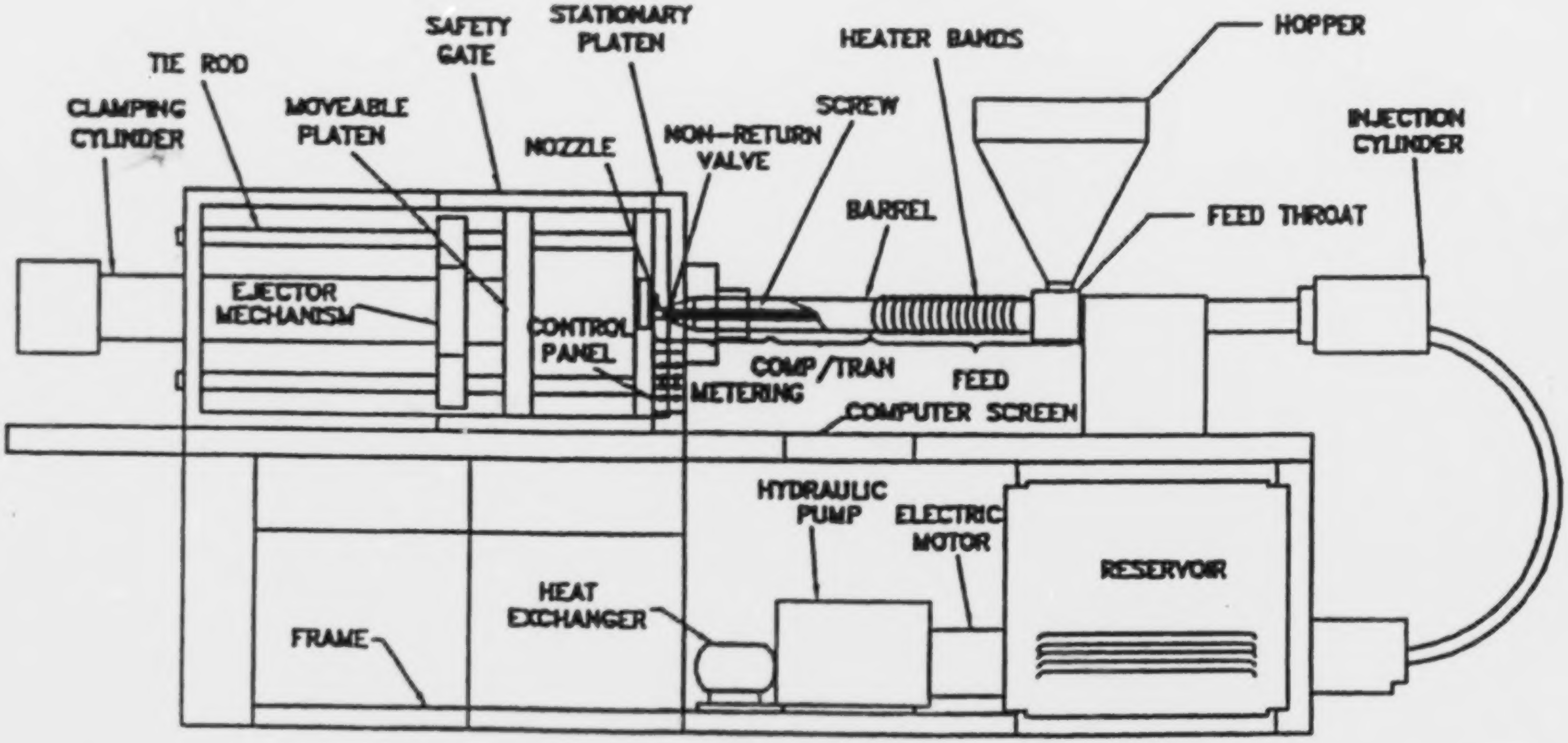
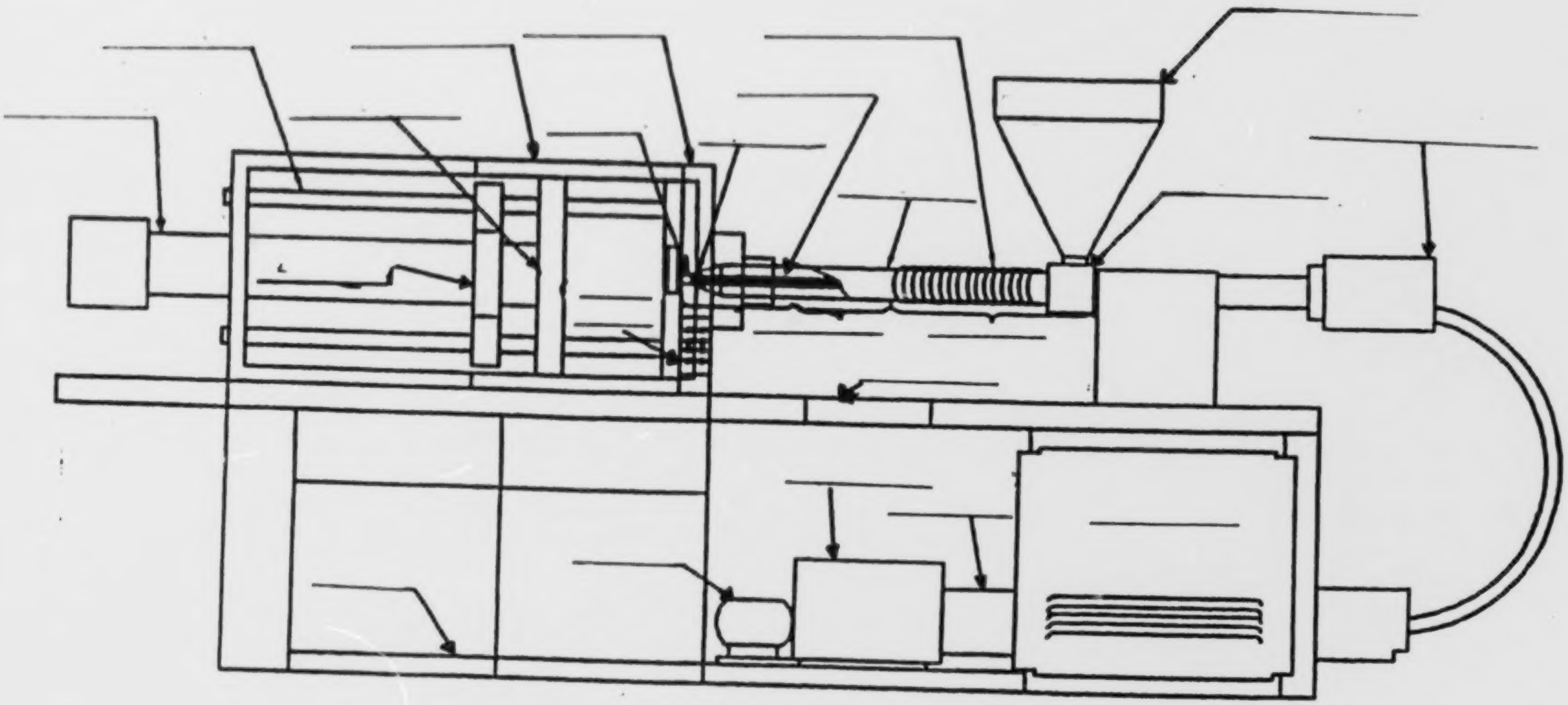
Identifying the Parts of the Injection Molding Machine


SAFETY GATE
STATIONARY PLATEN
HEATER BANDS
HOPPER
TIE ROD
CLAMPING CYLINDER
MOVEABLE PLATEN
NOZZLE
NON-RETURN VALVE
SCREW
INJECTION CYLINDER
BARREL
FEED THROAT
EJECTOR MECHANISM
CONTROL PANEL
COMP/TRAN
METERING
FEED
COMPUTER SCREEN
HYDRAULIC PUMP
ELECTRIC MOTOR
RESERVOIR
HEAT EXCHANGER
FRAME

Identifying the Parts of the Injection Molding Machine



Project Future
Competency Area 1.0: Language Skills

Competency Number 1.2 Learn and Use Plastics Vocabulary

Lesson Number 1.2.6: Identify Parts of the Injection Mold

Lesson Objective: Given a picture of an injection mold, the trainee will be able to identify the selected areas with percent accuracy by selecting words from a list.

Prerequisite Skills: The trainee will be able to read simple sentences.
The trainee will be able to print and to copy words.

Literacy Skills: The trainee will be able to apply information from class work to daily job requirements.
The trainee will be able to use a glossary to find information.

Presentation:

I. The trainees will be given a picture of an injection mold with all parts labeled. The trainees will define the labeled parts by using the glossary they have used for the Injection Molding vocabulary lesson.

II. After the trainees complete the definitions, the trainer will take the trainees to the mold shop and lead the trainees in identifying the parts of the mold and their function.

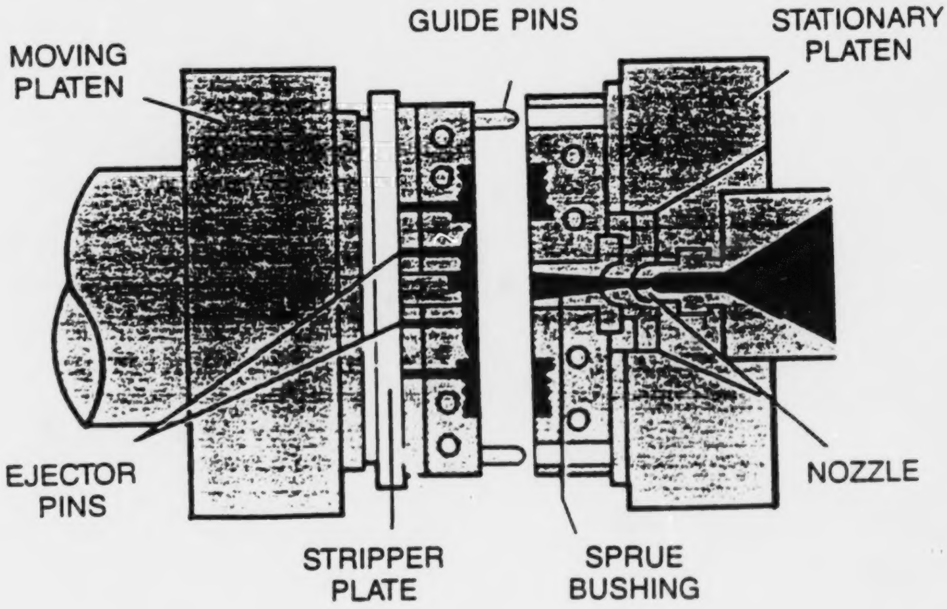
Evaluation: Trainees will complete the exercise: Identifying The Parts of an Injection Mold.

Extension: The trainees will use a manual to identify the hook-up connections of a VCR in order to install and use the appliance.

Identifying Parts of the Mold

Study the diagram below. See if you can identify the parts of the mold with the parts of the product that comes out. This is a good technique for helping you remember information. Try to associate new information with what you already know.

Check your memory skills by labeling the parts of the mold below.

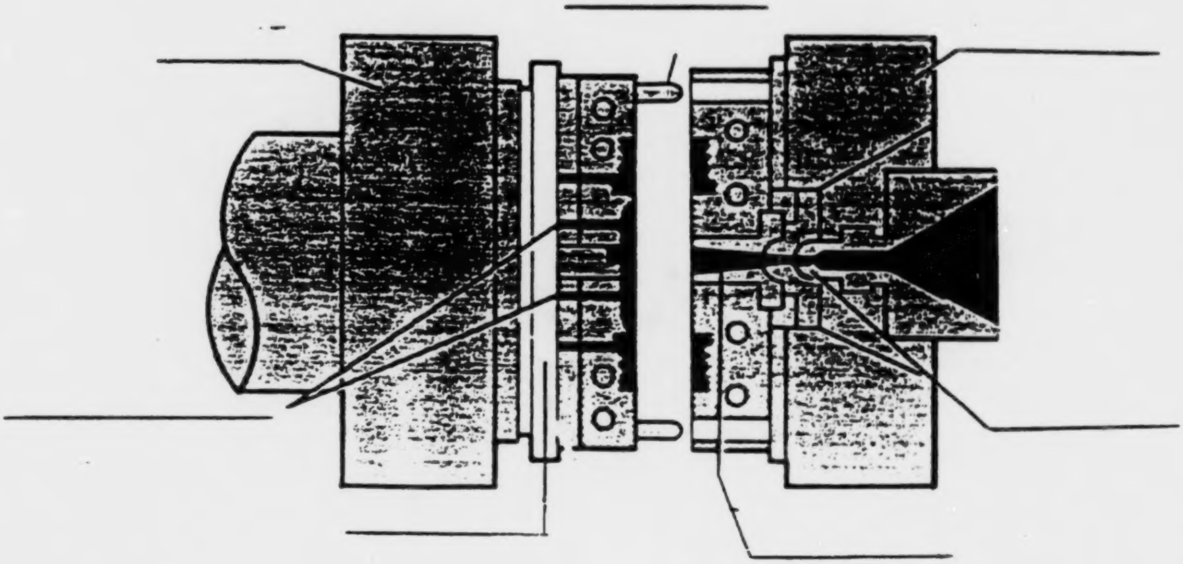

GUIDE PINS
STATIONARY PLATEN
MOVING PLATEN
EJECTOR PINS
NOZZLE
STRIPPER PLATE
SPRUE BUSHING

Parts of a Three-Plate Mold

Identifying Parts of the Mold

Study the diagram below. See if you can identify the parts of the mold with the parts of the product that comes out. This is a good technique for helping you remember information. Try to associate new information with what you already know.

Check your memory skills by labeling the parts of the mold below.



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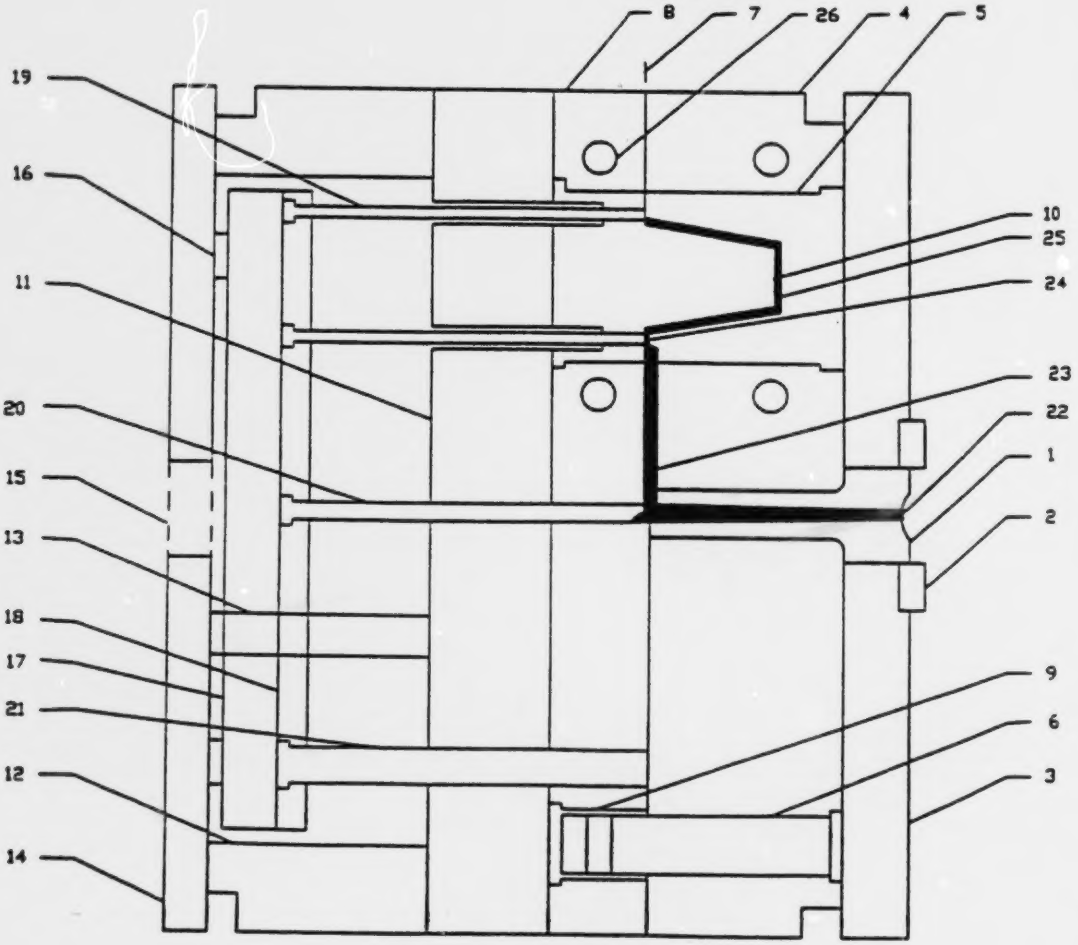
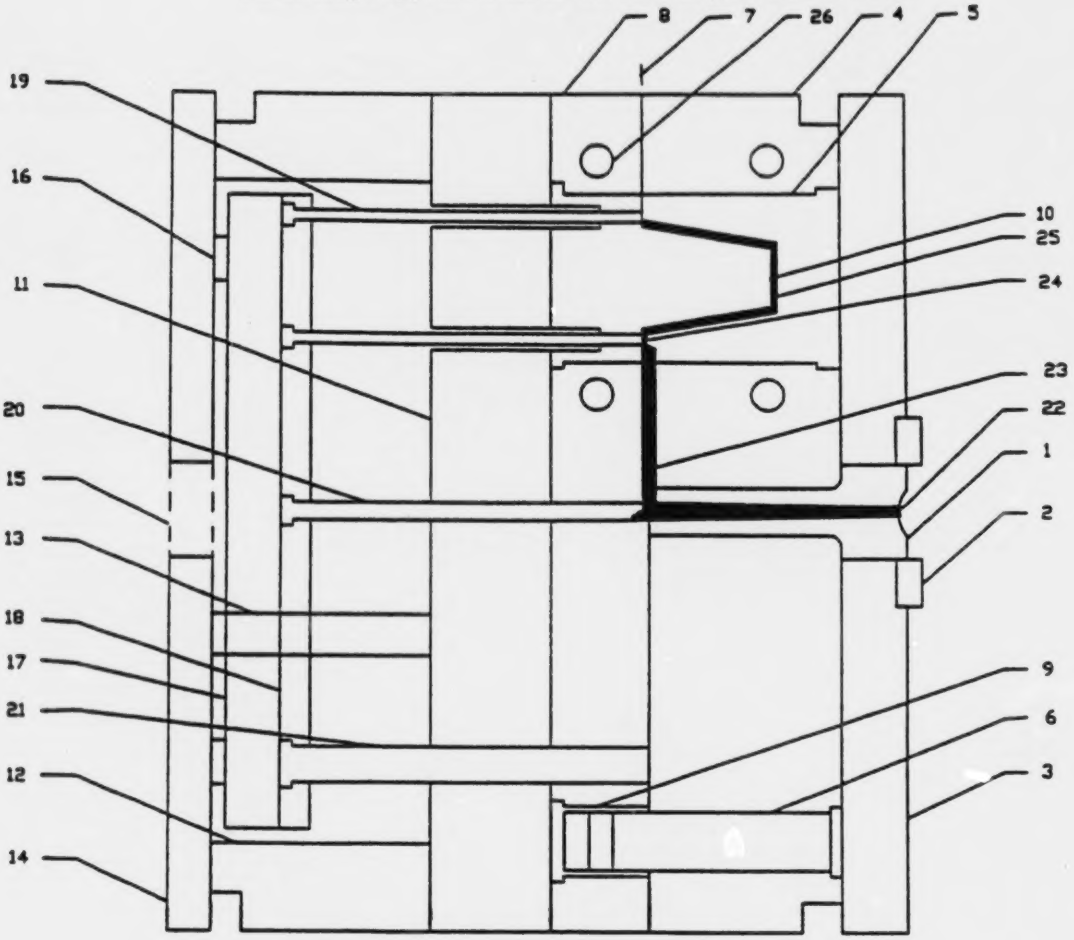
Identifying the Parts of the Injection Mold

1. Sprue Bushing - connects mold to nozzle of press.
2. Locating Ring – locates mold on stationary paten of the press.
3. Front Clamping Plate – connects stationary half of the mold to stationary platen of the press.
4. A-Plate – usually contains cavity inserts.
5. Cavity Inserts – forms outside of the parts.
6. Leader Pin – Ensures alignment of the mold halves.
7. Parting Line – line where the mold halves meet.
8. B-Plate – usually contains core inserts.
9. Leader Pin Bushing – acts as a guide for the leader pins.
10. Core Insert – forms inside of the part.
11. Support Plate – provides support for the B-Plate.
12. Support Rails – Supports B-Plate & forms the ejector plate.
13. Support Pillar – supports B-Plate & guides the ejector plate.
14. Rear Clamping Plate – connects moving half of the mold to the moving platen of the press
15. Hole for Knockout Rod – provides mechanism to move ejector plate.
16. Ejector Stop Pad – stops the ejector plate's back position.
17. Ejector Plate – pushes the ejector pins forward for part removal.
18. Ejector Retainer Plate – retains ejector pins
19. Ejector Pins – pins used to eject part from mold
20. Sprue Puller – pulls sprue from the sprue bushing when the mold opens.
21. Return Pin – returns ejector plate when the mold closes.
22. Sprue – channel to bring material from the nozzle of the press to runner of the mold
23. Runner – brings material from sprue to the gate.
24. Gate – takes the material from runner & directs the flow into the cavity.
25. Part – Difference between cavity and core.
26. Waterlines – Removes heat from the plastic and allows it to harden.



2-PLATE MOLD

Identifying the Parts of the Injection Mold


8
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26
4
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16
11
20
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13
18
17
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12
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25
24
23
22
1
2
9
6
3

2-PLATE MOLD

1. ____________________
2. ____________________
3. ____________________
4. ____________________
5. ____________________
6. ____________________
7. ____________________
8. ____________________
9. ____________________
10. ____________________
11. ____________________
12. ____________________
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16. ____________________
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20. ____________________
21. ____________________
22. ____________________
23. ____________________
24. ____________________
25. ____________________
26. ____________________

Project Future
Competency Area 1.0: Language Skills

Competency Number 1.2: Learn and Use Plastics Vocabulary

Lesson Number 1.2.7: Correctly Spell Commonly Used Plastics Terms

Lesson Objective: Given a paragraph containing misspelled words, the trainee will be able to correct the misspellings. The trainer will check for proper corrections.

Prerequisite Skill: The trainee will be able to read.

Literacy Skill: The trainee will be able to apply basic spelling rules.

Presentation:

I. Trainer will explain that there are times when trainees will be required to complete forms and reports. To prevent misunderstanding and costly errors, it will be important to correctly spell all words, especially specific plastics terms.

II. The trainer will begin the lesson by writing the following on the board or on a flip chart:

> *The mashen is not workn rite. It is brok. It is shoting the parts out to fash an they are shourts. I kneed you to fis it.*

The trainer will write corrections on the board as the class instructs.

III. The trainer will present the handout, Spelling Rules and Clues, to the trainees. The trainer will briefly read through the handout and write examples on the board.

IV. Divide the trainees into smaller groups. Using the glossary from the previous vocabulary lessons, the trainees will find examples of as many of the spelling rules as possible. Ask the trainees to underline the part of the word that corresponds to the rule and write the number of the rule beside the word. Ask groups to share results.

Evaluation: Trainees will complete the exercise Material Safety Data Sheet by locating the misspelled words and writing the correction above the word. Instruct trainees to check the spelling of any words of which he/sh may be unsure in the dictionary.

Extension: Trainees will write a short essay on a topic of their choice. Trainees will proof- read their essays and correct spelling.

Spelling Rules and Clues

You can improve your spelling if you really want to, but you must work at it. Learning to spell is your own personal responsibility. There are many ways to learn to spell. Some of these ways are listed below:

1. In a notebook, keep a list of the words you misspell.
2. Get the "dictionary habit."
3. Proofread your written work before sending it on to someone else--especially your supervisor.
4. Learn to spell words by syllables.
5. Learn to pronounce words correctly.
6. Use your ears, eyes, and pencil when learning to spell a word.
7. Learn lists of commonly misspelled words.
8. Learn to spell by making associations. Smell looks just like *spell* except for the first two letters.
9. Learn a few helpful spelling rules and apply them.

Common Spelling Rules

1. Write *ie* when the sound is $\overline{ee}$, except after *c*.

   Examples: Believe, thief, fierce, ceiling, receive, deceive

   Exceptions: Seize, either, weird, leisure, neither, financier

   Write *ei* when the sound is not $\overline{ee}$, especially when the sound is $\overline{a}$.

2. When the prefixes *il-*, *in-*, *im-*, *un-*, *dis-*, *mis-*, *re-*, and *over-* are added to a word, the spelling of the word itself remains the same.

   Examples: il + legal = *il*legal
   im + movable = *im*movable
   over + run = *over*run
   mis + understood = *mis*understood
   un + excused = *un*excused
   dis + satisfied = *dis*satisfied

3. When the suffixes *-ness* and *-ly* are added to a word, the spelling of the word itself remains the same.

   Examples: final + ly = final*ly*
   full + ness = full*ness*

   Exceptions:
   true + ly = tru*ly*

   For words ending in *y*, change the *y* to *i* before adding a suffix.

   Example: Ready--read*ily*, heavy--heav*ily*, happy--happ*iness*

4. Drop the final *e* before a suffix beginning with a vowel.

Examples: care + ing = car*ing* use + able = us*able*

Exceptions: Keep the final *e* before *a* or *o* if necessary to retain the soft sound of *c* or *g* preceding the *e*: noticeable, courageous. Also the word *dye* + *ing* is spelled dyeing to prevent its being confused with dying.

Keep the final e before a suffix beginning with a consonant.

Examples: care + ful = care*ful* care + less = *careless*

Exceptions: true + ly = tru*ly* argue + ment = argu*ment*

5. Observe the rules for spelling the plural of nouns.

   a) The regular way to form the plural of a noun is to add an *s*.
   Examples: chair, chair*s* manual, manual*s*, machine, machine*s*

   b) The plural of some nouns is formed by adding *es*. The *e* is necessary to make the plural form pronounceable in the case of words ending in *s, sh, ch*, and *x*.
   Examples: dress, dress*es* bush, bush*es* box, box*es*

   c) The plural of nouns ending in *y*, following a consonant, is formed by changing the *y* to *i* and adding es.
   Examples: Fly, fl*ies* lady, lad*ies* salary, salar*ies*

   d) The plural of nouns ending in *y* following a vowel, is formed in the usual way.
   Examples: key, key*s* donkey, donkey*s*

   e) The plural of most nouns ending in *f* or *fe* is formed by adding *s*. The plural of some nouns ending in *f* or *fe* is formed by changing the *f* or *fe* to *v* and adding *es*.
   Examples: Add *s*: roof, roofs dwarf, dwarf*s* chief, chief*s*
   Change *f* or *fe* to *v* and add *es*:
   knife, kniv*es* calf, calv*es* leaf, leav*es*
   loaf, loav*es* wharf, wharv*es*

   f) The plural of nouns ending in *o*, following a vowel, is formed by adding *s*. The plural of most nouns ending in *o* following a consonant is formed by adding *es*, except for nouns related to music.
   Examples: *o* following a vowel: rodeo, rodeo*s* radio, radio*s*
   o following a consonant: hero, heroes potato, potatoes
   nouns related to music: piano, pianos solo, solos

   g) The plural of a few nouns if formed by irregular methods:
   Examples: child, child*ren* tooth, t*ee*th woman, wom*en*
   mouse, *mice* ox, ox*en* goose, geese

h) The plural of compound nouns (more than one word) is formed by making the *principal* or *main* word plural.
Examples: mother-in-law, mothers-in-law passer-by, passers-by

i) The plural of compound nouns ending in *-ful* is formed by adding *s* to the end of the word.
Examples: cupful, cupfuls handful, handfuls

MATERIAL SAFETY DATA SHEET

OSHA requires that all employees be properly informed about all hazardous chemicals or mateerials preseneet in the work place. You should receive a copy when you ax for it. *Your* company must adher to these Right-To-No-Laws. The Material Safety Data Sheet (MSDS) is a documeint created by chemical or matrial manufactures to esplain the hazzerds which can ocur whin deeling with chemicals. The MSDS also explans how the chemical should be used, handled, and stord to prevint bodly harm. All set-up employes should know where these sheets are located in *thier* company and have ases to them. Below is a list of the information included in a MSDS. In some cases, some of these topics are not required.

1. Chemical identification
2. Hazardous ingredients
3. Physical data (i.e. apearence, smell, etc.)
4. Fire & explosion data (i.e. flesh pionts, melt pionts, etc.)
5. Health hazzards
6. Reactivity data (what other chemicals does it react with?)
7. Spill or leek proceedure 0 clean up proceedure
8. Special protective eqiupment required during use
9. Other specail precations

Reading Material Safety Data Sheets

OSHA requires that all employees be properly informed about all hazardous chemicals or materials present in the workplace. You should receive a copy when you ask for it. Your company must adhere to these Right-To-Know-Laws. The Material Safety Data Sheet is a document created by chemical or material manufacturers to explain the hazards which can occur when dealing with chemicals. The MSDS also explains how the chemical should be used, handled, and stored to prevent bodily harm. All set-up employees should know where these sheets are located in their company and have access to them. Below is a list of the information in an MSDS.

Below is a list of the information included in an MSDS. In some cases, some of these topics are not required.

1. Chemical identification.
2. Hazardous ingredients.
3. Physical data (i.e. appearance, smell, etc.).
4. Fire and explosion data (i.e. flash points, melt points, etc.).
5. Health hazards.
6. Reactivity data (what other chemicals does it react with?).
7. Spill or leek procedure--clean up procedure.
8. Special protective equipment required during use.
9. Other special precautions.

Project Future
Competency Area 1.0: Language Skills

Competency Number 1.2:	Learn and Use Plastics Vocabulary
Lesson Number 1.2.8:	Determine the Meaning of Unknown Terms by Using Context Clues
Lesson Objective:	Given five paragraphs containing plastics vocabulary, the trainee will be able to correctly use context to determine the meaning of the terms. The trainee will correctly identify 10 of the 15 terms.
Prerequisite Skill:	The trainee will be able to read.
Literacy Skills:	The trainee will use context clues to determine the meaning of a word. The trainee will write summary sentences to explain the meanings of new words or terms.

Presentation:

I. Trainer will explain that it is almost impossible for students to know every term they will encounter. However, they must develop some strategy for being able to understand the basic meaning of a word whenever a dictionary or glossary is not available.

II. The trainer will write two or three sample sentences on the board. Each of these sentences should contain a foreign word or phrase that the class can figure out.

For example:

- May I *accompanar* you home? (May I accompany you home?)
- The *antena* on the television needs to be fixed. (The antenna on the television needs to be fixed.)
- I am very afraid! Please call for the *securidad* guard. (I am very afraid! Please call for the security guard.)

Have trainees explain how they knew what the words were. Have them examine their thought processes.

Evaluation: The trainee will complete the exercise, Using Context Clues to Determine Word Meanings.

Extension: Trainees will read company information on the 401k Plan and will list the terms they had to define by using context clues.

Using Context Clues to Determine Word Meanings

The total situation in which a word is used is called its context. The words that surround a particular word are one part of the context. The circumstances in which it is used are another part.

Verbal Context

The other words in the sentence are the verbal context of a word. They often supply clues to meaning. For example, if you did not know the meaning of the word *pedestrians*, you would probably be able to guess it from the surrounding words in the following sentence:

Because there were no sidewalks, pedestrians had to be careful to avoid cars.

Sidewalks are intended for people to walk on. Since the absence of sidewalks makes this street or road dangerous for *pedestrians*, the word probably has something to do with "walking people" or "people who are on foot." Of course, guesses based on context turn out to be wrong sometimes, but they are well worth making. In fact, you have learned most of the words you know by making guesses of this kind.

Physical Context

The actual situation being discussed is the physical context. Suppose that you happen to hear someone say, "At last he's got a strike." This time the other words in the sentence are not much help if you do not know what strike means. What does help is knowing what the speaker is talking about. If he is watching a baseball game, strike means one thing; it means quite another if he is talking about labor relations. We call this *physical context* because surrounding--in this case, a baseball park or a factory--usually gives us the clue we need.

Since the two kinds of context work together to help you discover the meaning of unfamiliar words, it is not important that you be able to distinguish one kind from the other. What is important is that you remain alert to all possible clues that a situation may provide to the meaning of a new word.

Exercise

Write a short summary sentence explaining the meaning of the italicized word in the following sentences.

From an injection-molding production manual:

1. The flow of plastic material through the heating cylinder of the injection unit is continually *extracting* heat from the metal parts.

2. Carelessness in materials handling is one of the quickest ways to destroy your *reputation* as a good worker in the boss's eyes.

3. A thermoplastic acts like candle wax. It can be melted, hardened, and remelted many times. Cooling is all that is needed to turn it *rigid*.

4. So if scrap thermoplastic is kept dry, is not damaged by too much heat, and is not *contaminated* by dirt or non-compatible plastic resins, previously molded materials can be reused.

5. So if scrap thermoplastic is kept dry, is not damaged by too much heat, and is not contaminated by dirt or *non-compatible* plastic resins, previously molded materials can be reused.

6. This ground-up scrap, called regrind, is just as valuable as new material. From your first day on the job, learn to *conserve* regrind.

From an injection molding quality control manual:

7. Every employee must be a part of quality control. The operator is normally the only person who sees every molded part. As a machine operator, your part in this process is particularly *critical*.

____

____

8. *Devices* of various types that allow you to measure parts may be provided at the machine.

____

____

9. In many cases, a picture of the part will be *displayed* at the molding machine.

____

____

10. This picture shows critical tolerances that must be watched when inspecting the part.

____

____

11. The best operator maintains a *consistent* cycle.

____

____

12. The best operators wear safety glasses and *proper* footwear and clothing.

____

____

13. The best operators are *alert* to unusual machine noises and knew that safety guards and devices are in place.

____

____

14. The best operators take no shortcuts that defeat machine *safeguards*.

____

____

15. As an operator, your are a part of the process to see that the customers' expectations are met.

____

____

Project Future
Competency Area 1.0 : Language Skills

Competency Number 1.3: Reading Work Related Forms and Charts

Lesson Number 1.3.1: Interpret Inspection Instruction Sheets

Lesson Objective: Given an inspection instruction sheet, the trainee will be able to answer eight of ten questions about information contained on the sheet.

Prerequisite Skill: The trainee must have knowledge of plastics terminology.

Literacy Skills: The trainee will read and follow written and verbal instructions.
The trainee will apply skills learned in previous classes to current assignments.

Presentation:

I. Prior to beginning instruction, the trainer will gather one sample part for each trainee. The trainees use these samples to practice inspections.

II. Trainee will read over the Inspection Instruction Sheet using the guidelines in the Handout, Tips for Reading Forms and Charts.

III. Trainees will use sample parts to practice the inspection instructions.

Evaluation: Trainees will complete the exercise: Reading Inspection Instruction Sheets.

Extension Activity: The trainees will read instructions and complete an Insurance Claim form.

Tips For Reading Forms and Charts

1. Look at the title of the form. The title will tell you whether you have the correct form for the job. In most cases, it will also tell you the major purpose for the form.

2. Check to see whether the form/chart is one page or more.

3. Skim the form/chart and look for any subheadings or instructions.

4. Look for any handwritten additions. Many times these are the most important words on the form or chart.

5. Read all parts of the form/chart through before asking any questions.

6. Mark areas about which you have a question.

7. Ask your supervisor about all areas of which you are uncertain. Make notes if you need to.

8. If the form/chart was prepared for use by several departments, ask your supervisor if you are responsible for all areas. If not, ask which areas are your responsibility and mark them.

9. Be sure of each instruction.

10. If you are in doubt, ASK.

FUTURA PLASTICS
INSPECTION INSTRUCTION SHEET

SHEET ____ OF ____

CUSTOMER: __________
PART NO.: ________________
REVISION: ____________
DATE: ______________

OPERATION #: ________
PART NAME: ______________
PREPARED BY: ______________
DATE: ______________

MOLD #: _____________
PART CODE: ______________
APPROVED BY: ______________
DATE: ______________

# OF CAVITIES: _______
STD PART WEIGHT: ______
CUSTOMER APPROVAL: __________
DATE: ______________

PROCEDURE:

1. FOLLOW THE REFERENCE SPECIFICATIONS.
2. USE THE GAUGES LISTED BELOW.
3. INSPECT EACH OF THE CHARACTERISTICS LISTED BELOW IN ACCORDANCE WITH THE PRESCRIBED METHOD.
4. INSPECTION WILL BE PERFORMED IN ACCORDANCE WITH THE SAMPLE SIZE AND FREQUENCY CALLED FOR.
    - A. WHEN NON-CONFORMING PARTS OCCUR, INFORM SUPERVISOR AND INSPECTOR.
    - B. PARTS ARE TO BE FREE OF OBJECTIONABLE APPEARANCE DEFECTS. SEE EXHIBITS FROM STANDARDS ROOM.

ITEM NO.	CHARACTERISTIC	METHOD OF MEASUREMENT	FREQ. CHECK	CHECK BY	TYPE	CATEGORY
1	WATCH FOR SHORTS ON ALL BOSSES. NOT PASSABLE.	VISUAL	100%	0		III
2	SMALL COLOR SPECS PASSABLE.	VISUAL	100%	0		III
3	WATCH FOR PART LINE FLASH-TRIM WHEN PRESENT.	VISUAL	100%	0		III
4	FLASH NOT PASSABLE IN CENTER DIAMETER HOLE.	VISUAL	100%	0		III
5	CENTER HOLED DIAMETER .380-.390. NOT A THRU HOLE.	GAGE PIN	2 HOURS	0		II
6	(4) HOLES AROUND LIP OF PART - MEASURE FROM TOP TO STEP. .195-.205 DIAMETER AND .250 - .280 DEEP.	GAGE PIN/ CALIPER	2 HOURS	0		II
7	(4) HOLES AROUND LIP OF PART - MEASURE FROM BOTTOM .133 -.143 DIAMETER THRU HOLE.	GAGE PIN/ CALIPER	2 HOURS	0		II
8	WATCH FOR FLASH IN CHANNEL AROUND LIP OF PART.	VISUAL	100%	0		III
9	PART MUST BE FLAT. WARPAGE NOT TO EXCEED .075 WHEN LYING FLAT.	GAGE PIN/ CALIPER	2 HOURS	I		III
10	PARTS DO NOT GET FIXTURED.	VISUAL	FIRST PIECE	I		III
11	WATCH FOR WELD LINE ON PART COMING FROM CENTER HOLE OR FROM (4) HOLES AROUND LIP - MUST CORRECT PROBLEM.	VISUAL	100%	0		III

*F = FOREMAN
*O = OPERATOR
*I = INSPECTOR

Reading Inspection Instruction Sheets

Read the Inspection Instruction Sheet provided and answer the following questions.

True or False

_____1. Shorts on bosses are passable.

_____2. The center holed diameter is a "thru" hole.

_____3. Parts do not get fixtured.

_____4. Warpage of .06 is acceptable.

_____5. Small color specs are not passable.

Fill in the blank

6. Watch for ____________ in the channel around the lip of the part.

7. The part must be _____________, warpage not to exceed .075 when laying flat.

8. Watch for ______________________ flash and trim it when present.

9. Watch for ___________ on all bosses.

10. Watch for __________________________________ on part coming from center hole or from the four holes around the lip.

Project Future
Competency Area 1.0: Language Skills

Competency Number 1.3: Reading Work-Related Forms and Charts

Lesson Number 1.32: Interpret Quality Control Requirements Sheets

Lesson Objective: Given a Quality Control Requirements Sheet, the trainee will be able to answer eight of ten true/false items about information contained on the sheet.

Prerequisite Skill: The trainee must have knowledge of plastics terminology.

Literacy Skills: The trainee must be able to read.

Presentation:

I. Prior to beginning instruction, the trainer will gather three sample parts for each of the trainees. At least one of these samples must contain a defect that makes the part not passable. The trainees use these samples to practice inspections.

II. Trainee will read over the Quality Control Requirements Sheet using the guidelines in the handout, Tips for Reading Forms and Charts, from the previous lesson.

III. Trainees will use sample parts to practice the instructions. Trainee must identify the not passable part and will explain the defect that makes the part not passable.

Evaluation: Trainees will complete the exercise, Reading Quality Control Requirements Sheets.

Extension Activity: The trainees will complete a credit application for a charge card.

QUALITY CONTROL REQUIREMENTS

K.D. Lamp	3743	KDL-38 (Clear)
	3741	KDL-40 (Amber)
	3746	KDL-66 (Red)

1. Parts must be clear, not cloudy.
2. Color is not passable.
3. Gates must be smooth.
4. Air bubbles are not passable.
5. Flash is not passable.
6. Shorts are not passable.
7. Sinks in the center are not passable.

Boxing: P0002 Carton
36 parts per layer
Tissue paper between each layer
12 layers high
Total pcs. 432

Boxing: 40 to a layer
15 layers high
Total pcs. 600

Alternate Boxing:
15x15x15
36 pcs. per layer
8 layers high
use divider pads, not tissue paper
Total pcs. 288

(If you feel a need for safety glasses or ear protection ask your Q.C. for them.)

QUALITY CONTROL REQUIREMENTS
Mug Tray

1) Parts must be the correct color.

2) Sprur gate must be milled even with the surface of the tray. Let five parts set up with cut off runner before milling.

3) Flash is not passable; watch cored sections on top and on ends of tray.

4) Stress on cavity is not passable.

5) Caption channels must be glued on both sides pf the part. When putting the caption channel on, put it all the way to the right of the part. You will have a cap on the other end, but that is the way it is supposed to be.

6) Shorts are not passable.

7) Color streaks are not passable.

BOXING: Insert inside box with flaps folded to sit flat. Seven parts per carton with dividers between each part and a divider on top of part.

Reading Quality Control Requirements Sheets

Using the Quality Control Requirements Sheet provided, tell whether each of the following statements are True or False. (Write True or False on the blanks.)

_____1. The K. D. Lamp parts must be clear.

_____2. The American Greeting mug trays, the parts may be slightly off color.

_____3. On American Greeting mug trays, color streaks are not passable.

_____4. The K. D. Lamp parts that have air bubbles are passable.

_____5. You may pass sinks in the center of K. D. Lamp parts.

_____6. American Greeting parts are to be boxed 40 to a layer.

_____7. K. D. Lamp parts are to have a divider between each part and a divider on top of parts.

_____8. When putting the caption channel on the American Greetings part, it is to be put all the way to the left of the part.

_____9. On the American Greetings parts, stress on the cavity is passable.

____10. When trimming the K. D. Lamp parts, gates must be smooth.

Project Future
Competency Area 1.0: Language Skills

Competency Number 1.3: Reading Work-Related Forms and Charts

Lesson Number 1.3.3: Identify Product Defects and Complete Defects Sheets.

Lesson Objective: Given eight parts, the trainee will correctly identify the defects on all parts and record the defects in the correct places on the Defects Sheet.

Prerequisite Skill: The trainee must have knowledge of plastics terminology.

Literacy Skills:
The trainee will read sentences and paragraphs.
The trainee will read information in spreadsheet form.
The trainee will apply what he/she reads to simulated situations.

Presentation:

I. Prior to beginning instruction, the trainer will gather eight sample parts from the production floor. All but one of these samples must contain a defect. The trainees use these samples to practice identifying and recording the defects.

II. Trainee will study the handout, Identifying Molding Defects. Trainees underline any words of which they are unsure. The trainer should ask the large group to call out these words as the trainer writes them on the board. Ask for volunteers to explain the words, skipping those for which there are no volunteers. For words that are skipped, ask trainees to use their glossaries and dictionaries to find definitions for the words. Have the first trainee to locate the word and read the definition aloud.

Evaluation: Trainees read the handout, Instructions for Completing the Reject Sheet. Using this sheet, the trainee will identify the defects, if any, in the eight sample parts collected by the trainer. The trainees will record the defects in the appropriate boxes on the Reject Sheet provided.

Extension Activity: Using a newspaper, the trainees will read the "Help Wanted" advertisements and will answer questions about the advertisements. The trainees will circle those advertisements that they feel would make use of the skills they have acquired as manufacturing employees.

SECTION 2

Identifying Molding Defects

There are many different types of defects which occur in molded thermoplastic parts. The causes of these defects can be traced to the molding machine, the mold, or the material. However, the specific defect must be identified by the process engineer or trouble-shooter before a solution can be suggested and the molding parameters changed to relieve the problem.

This section of the Trouble Shooting Guide for Injection Molders is intended to assist the molder in identifying specific defects in molded parts. The illustrations presented here show molding defects and describe their physical appearance. Note that the illustrations accentuate the defects to enhance identification. In actual practice, some defects can be seen only with the aid of a magnifying glass.

After the defects is found and identified, there is a tendency for the machine operator to overreact in making changes in the machine operating parameters. Use caution. Make only one change at a time and then permit the machine to stabilize after each change. A good rule of thumb is to wait for about 10 shots after a pressure or time change. When making adjustments in temperature, it is advisable to wait for 20 to 30 shots, then re-examine the parts.

It also is highly recommended that records be kept of all changes made and of the results of the changes in the molded part.

Jetting: Turbulence in the resin melt flow caused by undersized gate, abrupt change in cavity volume, or too high injection pressure.

Black Specks: Particles in the surface of an opaque part and visible throughout a transparent part.

Splay Marks (Silver Streaking, Splash Marks): Marks or droplet type imperfections formed on the surface of a finished part.

Excessive Warpage/Shrinkage: Excessive dimensional change in a part after processing, or the excessive decrease in dimension in a part through cooling.

Clear Spots: Surface imperfection resulting from usage of unplasticized pellets.

Brittleness: Tendency of a molded part to break, crack, shatter, etc. under conditions which it would not normally do so.

Blush: Discoloration generally appearing at gates, around inserts, or other obstructions along the flow path. Usually indicates weak points.

Burn Marks: Black marks or scorch marks on surface of molded part; usually on the side of the part opposite the gate in a deep cavity.

Poor Weld Lines (Knit Lines): Inability of two melt fronts to knit together in a homogeneous fashion during the molding process, resulting in weak areas in the part of varying severity.

Flash: Excess plastic around the area of the mold parting line on a molded part.

Blister: Defect on the surface of a molded part caused by gases trapped within the part during curing.

Crazing: Fine cracks in part surface. May extend in network over the surface or through the part.

Voids (Bubbles): An unfilled space of such size that it scatters radiant energy such as light.

Delamination (Skinning): Surface of the finished part separates or appears to be composed of layer of solidified resin. Strata or fish scale type appearance where the layers may be separated.

Flow Lines and Folds: Marks visible on the finished item that indicate the direction of flow in the cavity.

Cracking: Fracture of the plastic material in an area around a boss, projection, or molded insert.

Low Gloss: Surface roughness resulting from high speed fill which causes surface wrinkling as the polymer melt flows along the wall of the mold.

Short Shot: Injection of insufficient material to fill the mold.

SECTION 3

Causes and Solutions Of Molding Defects

Black Streaks, Specks

Problem	Solution
Contamination of material.	Examine material for contamination, particularly if reground resin is being used. Check machine hopper.
Holdup of molten resin in molding machine or mold runner system.	Examine nozzle seal, cylinder walls and valves for "dead spots", surface roughness and charred material. Polish surface of cylinder and streamline to prevent hold up of material. Be sure that runner system is streamlined.
Press contamination	Raise stock temperature to loosen degraded resin from cylinder walls and purge.
Local over-heating in the injection cylinder.	Examine heater bands and controls for malfunctioning unit. Locate hot spot and remedy problem.
Defective closure of the nozzle.	Repair or replace nozzle as required.
Oxidation or occluded air or inadequate air venting.	Provide additional vents in mold.
Mold contains grease.	Remove and clean.
Trapped air.	Increase stock temperature.
Inefficient injection speed	Decrease injection pressure, decrease booster time.

Blisters

Problem	Solution
Screw rpm too high.	Reduce screw rpm.
Back pressure too low.	Increase injection back pressure.
Mold temperature too low.	Raise mold temperature.

Gate improperly located.	Relocate gate.
Insufficient venting.	Provide additional mold vents.
Regrind too coarse.	Material needs additional regrinding.

Blush

Problem	Solution
Mold temperature too cold.	Increase mold temperature.
Injection fill speed too fast.	Reduce injection fill speed.
Melt stock temperature too high or too low.	Analyze and raise or lower accordingly.
Improper gate location.	Relocate gate.
Sprue and nozzle diameter too small.	Increase diameters.
Nozzle temperature too low.	Raise nozzle temperature.
Insufficient cold slug well.	Increase in size or number.
Sharp corners in gate area.	Repair or redesign gate.
Resin excessively moist.	Pre-dry material.
Inadequate injection pressure.	Increase injection pressure.

Brittleness

Problem	Solution
Mold temperature too high.	Decrease mold temperature.
Inadequate cooling in gate area.	Improve cooling channels to prevent heat buildup in gate area of core and cavity.
Gate section of item too thin (gate brittleness)	Increase thickness at gate.
Resin too cold.	Increase cylinder temperature. Increase back pressure. Change screw speed and use higher compression screw.
Non-uniformity of resin temperature.	Increase cycle time.
Undried material.	Dry material before usage.
Contamination.	Check hopper, material handling system and press; purge if necessary.
Poor part design.	Redesign part.
Material degraded.	Evaluate resin supply. Make adjustment in pre-cycle preparations. Replace if necessary.
Non-compatible mold release	Consult supplier of resin or mold release for compatible formulation.

Packing the mold.	Reduce feed and injection pressure, increase mold close time.
Melt temperature too cold.	Increase cylinder and/or mold.
Excessive amounts of regrind.	Decrease amount of regrind in feed.
Inadequate mold temperature.	Increase mold temperature.
Excessive screw rpm.	Decrease screw rpm.
Excessive back pressure	Decrease back pressure.
Insufficient venting	Add more gas vents.
Improper gate location.	Change location of gate.
Excessive injection speed.	Decrease injection speed.
Excessive residence time.	Reduce overall cycle time.
Melt temperature too high.	Reduce melt temperature.
Nozzle too hot.	Lower nozzle temperature.
Injection pressure too low (weld lines).	Increase injection pressure.
Runners and gates inadequate (weld lines)	Increase dimensions o f runners and gate.
Dwell time in the injection cylinder too long (material degraded).	Decrease injection dwell time.
Material degraded during drying or per-heating.	Decrease length of predrying, pre-heating cycle; check hopper for contamination.

Bubbles

Problem	**Solution**
Insufficient drying of the material.	Increase time and/or temperature of pre-drying cycle.
Insufficient or badly disposed air vents.	Increase number of vents and/or improve positioning of vents.
Injection temperature too high.	Reduce injection temperature.
Insufficient feed of material.	Increase feed allotment.
Cooling too rapid.	Slow cooling cycle.
Thickness of the section too great.	Redesign part, tooling.
Runners or gate too small or badly dimensioned.	Increase and/or improve runner gate dimensions.
Inadequate injection forward time.	Increase injection forward time.
Injection pressure too low.	Increase injection pressure.
Cooling cycle in mold too long.	Decrease cooling time in the mold.
Excessive injection speed.	Decrease injection speed.
Excessive nozzle and metering zone temperature.	Decrease nozzle and metering zone temperature.
Feed zone temperature too low.	Increase feed zone temperature.
Material insufficiently plasticated.	Preheat feed. Increase residence time in cylinder.

Burns

Problem	Solution
Excessive injection speed.	Decrease injection speed.
Excessive injection pressure.	Decrease injection pressure.
Inefficient mold temperature.	Adjust mold temperature.
Excessive amount of volatiles due to improper venting.	Check venting of the cavity. If venting is inadequate, make provision for necessary venting. Vent cavity at point of air entrapment. Knockout pins can be relived to help in venting.
Improper gate location.	Relocate gate.
Front zone temperature too high.	Decrease front zone temperature.
Screw speed too high.	Decrease screw speed.
Excessive back pressure.	Decrease back pressure.
Compression ratio of screw too high.	Decrease compression ratio.
Faulty temperature controllers.	Adjust; replace if necessary.
Frictional burning - gates too small.	Increase gate dimensions.
Dead material hung up on screw or nozzle.	Purge.
Melt stock temperature too high or too low.	Analyze and raise or lower accordingly.
Nozzle diameter too small.	Increase nozzle diameter.
Over-heated heater band.	Check heater band functioning. Decrease heater band temperature.
Incorrect screw rpm.	Analyze screw rpm and adjust accordingly.

Clear Spots

Problem	Solution
Unplasticated pellets.	Improve plasticating capacity of machine by addition of specially designed nozzle. Increase cylinder temperature, increase cycle time. Use injection molding machine with higher plasticating capacity. Increase back pressure. Change screw speed. Use higher compression screw.

Cloudy Appearance

Problem	Solution
Low stock temperature.	Raise stock temperature.
Low mold temperature.	Increase mold temperature.
Moisture.	Redry resin.
Contamination.	Check for source of contamination and purge machine.

Contamination

Problem	Solution
Other molding materials, foreign objects (metal, wood, paper, dirt, etc.)	Check hopper, raw material containers, material handling systems and eliminate source of contamination. Purge system.

Cracks

Problem	Solution
Parts cool too quickly.	Increase mold temperature. Put parts in insulated container to cool.
Molded-in stress.	Reduce fill rate. Increase mold temperature.
Wall thickness too heavy for compound.	Use compound with higher molecular weight base.

Crazing

Problem	Solution
Insufficient drying of the material.	Increase time or temperature of pre-drying cycle.
Contamination.	Check supply, material handling system and press, purge if required.
Injection temperature too high (crazing accompanied by discoloring or yellowing).	Reduce stock temperature of melt.
Mold surface contaminated.	Clean mold surface in area of crazing.
Inadequate injection speed.	Increase injection speed.
Inefficient injection forward time.	Modify injection forward time.
Excessive injection pressure.	Decrease injection pressure.
Mold temperature too low.	Increase mold temperature. Use a runner block
Gate too large	

Deformation

Problem	Solution
Piece too hot on removal from the mold.	Increase cooling time and/or decrease mold temperature.
Malfunctioning of the ejector system or defective shape or positioning of ejector pins.	Repair or replace as required.
Excessive variations in thickness of the piece.	Redesign part to balance out distribution of material or to counter balance heavy variations.
Gates badly located or of insufficient section.	Increase size and/or relocate as required.
Injection temperature too high.	Reduce injection temperature.
Overpacking.	Slow injection speed, decrease pressure.
Insufficient draft.	Increase degree of taper.
Knockout pins too small.	Replace with larger pins.
Injection pressure too low.	Raise injection pressure.

Delamination

Problem	Solution
Contamination of resin by additives or other foreign material.	Examine resin for foreign materials particularly if regrind is being used. Check for contamination in hopper, handling systems, cylinder walls, mold, etc. Purge cylinder thoroughly to remove any other resin from previous runs. Check with pigment supplier to ascertain whether soaps or other incompatible additives have been used. Check resin used in color concentrate. If base resins are incompatible or too different in flow or density, delamination can result.
Resin temperature too low.	Increase cylinder temperature.
Non-uniformity of resin temperature.	Use higher back pressure, change screw speed. Use higher compression screw.
Wrong mold temperature.	Adjust mold temperature.
Excessive material moisture.	Dry material
Inadequate injection speed.	Increase injection speed.
Sharp corners at gate.	Radius all sharp corners at gate, radius base of sprue if sprue gate.
Incompatible polymers.	Change resins.

Discoloration

Problem	Solution
Contamination in heating cylinder.	Purge heating cylinder.
Melt temperature too high.	Reduce cylinder temperature. Decrease screw speed. Reduce back pressure.
Nozzle temperature too high.	Lower nozzle temperature.
Overall cycle too long.	Shorten overall cycle.
Contamination.	Check material flow path for contamination and eliminate.
Inefficient cooling.	Check for proper cooling of ram and feed zone.
Inadequate venting.	Provide additional vents in mold.
Excessive shot size.	Move mold to smaller shot size press.
Residence time in injection cylinder too long.	Decrease residence time. Check shot volume. Shorten cycle.
Local over-heating or stagnant zones of material in the injection cylinder.	Decrease temperature; increase pressure.

Jetting

Problem	Solution
Excessive injection speed.	Decrease injection speed.
Melt temperature too high.	Decrease stock temperature.
Melt temperature too low.	Increase stock temperature.
Mold temperature too low.	Increase mold temperature.
Nozzle opening too small.	Use larger opening in nozzle.
Gate land length too long.	Decrease gate land length.
Sprue, runner, and/or gate size too small.	Increase sprue, runner or gate size.
Nozzle heating band malfunction.	Check nozzle heating band.
Inefficient gate location.	Change gate location so that material will impinge off the opposite wall.

Flow Lines

Problem	Solution
Stock temperature too low.	Increase melt temperature.
Runners too small.	Increase runner size.
Improper gate size and/or location.	Increase size and/or relocate as needed.

Mold temperature too low.	Increase mold temperature.
Inadequate cold slug well.	Increase in size or number.

Lamination

Problem	Solution
Contamination	Check resin supply for contamination by incompatible material(s).
Inadequate mold temperature.	Increase mold temperature.
Resin excessively moist.	Pre-dry material.
Melt temperature too low.	Increase stock temperature.
Excessive injection speed.	Decrease injection speed.
Nozzle opening too small.	Use larger opening in nozzle.
Excessive gate land length.	Decrease gate land length.
Excessive injection pressure.	Decrease injection pressure.
Improper location of gate.	Change location of gate.
Purging compound left in cylinder.	Run several shots to clear cylinder.
Undersized sprue, runner or gate.	Increase dimensions of sprue, runner and/or gate.
Insufficient back pressure.	Increase back pressure.

Mold Flash

Problem	Solution
Mold parting surfaces do not seal properly.	Check and rework mold surface to obtain a good seal at the parting line.
Injection pressure too high.	Decrease injection pressure.
Clamp pressure set too low or projected area of item too large for clamp pressure of the machine.	Adjust clamp pressure to maximum. If use requirements permit, select a higher flow resin to reduce injection pressure requirements. Install mold in machine with higher clamping pressure. If large gates are used consider restricting gating.
Injection temperature too high.	Lower injection temperature.
Feed needs adjustment.	Adjust feed.
Hold time too long.	Decrease injection hold time.
Inadequate mold supports.	Replace.
Oversize vents.	Decrease size of vents and if necessary, increase number of vents.

Short Shots

Problem	Solution
Insufficient feed, cushion.	Adjust feed to minimum consistent cushion.
Inadequate injection pressure.	Increase injection pressure.
Inadequate injection speed.	Increase injection speed.
Insufficient booster or injection high-pressure time.	Increase booster or high-pressure time.
Inefficient screw delay.	Adjust screw delay.
Inadequate injection back pressure.	Increase back pressure.
Melt temperature too low.	Adjust screw speed to give higher melt temperature.
Cylinder temperature inadequate.	Raise cylinder temperature.
Mold temperature too low.	Increase mold temperature, particularly for very thin, large area parts. Use a short sprue with an extended nozzle.
Gates, sprues, and/or runners too small.	Enlarge gates, sprue diameters and runners.
Excessive screw flights in metering zone.	Use screw with shallower flights in the metering zone.
Insufficient venting.	Provide additional mold vents.
Improper gate location.	Relocate gates.
Melt index of resin too low.	If use requirements permit, select higher flow resin.
Excessive clearance between non-return valve and barrel.	Replace worn parts.
Screw bridging.	Reduce rear zone temperature, increase forward zone temperature.
Injection press of insufficient capacity.	Increase feed allotment.

Shrinkage

Problem	Solution
Injection pressure too low.	Increase injection pressure.
Hold time too short.	Increase injection hold time.
Cooling time too short.	Increase length of cooling cycle.
Stock temperature too high.	Lower melt temperature.
Mold temperature too high.	Decrease mold temperature.
Gate too small/not properly located.	Analyze and increase sizes accordingly. Relocate if needed.
Injection hold pressure too low.	Raise injection hold pressure.
Gate land length too long.	Decrease length of land.
Bad check valve.	Replace.
Insufficient cushion.	Adjust feed to increase cushion

Sink Marks

Problem	Solution
Resin feed inadequate.	Increase resin feed. Increase length of dwell of piston in full-pressure position to pack out mold
Improper mold design.	Enlarge runners and gates to prevent freeze-off before part can be packed properly. Locates gates on or as near as possible to thick section.
Parts cool too rapidly.	Slow cooling and retard cooling capacity by holding the part in an oven or in a well-insulated area.
Rib section in part too wide.	Decrease rib thickness to approximately 80% or less of adjoining wall.
Temperature of mold surface opposite rib too hot.	Operate mold surface opposite ribs lower than rib side.
Entrapped gas.	Provide additional mold vents.
Nozzle too restrictive, land length too long.	Decrease land length, adjust or replace nozzle.
Pressure too low.	Increase injection pressure.
Mold temperature too low or high.	Increase or decrease accordingly.
Stock temperature too high.	Decrease temperature of plastic melt.
Gate too small.	Increase gate dimensions.
Improper gate location.	Change location of gate.
Nozzle and metering zone temperatures too high.	Reduce nozzle and metering zone temperatures.
Excessive cooling time in mold.	Reduce cooling time in mold (may require a cooling fixture or water bath).
Unbalanced flow pattern.	Increase gating; increase shot weight, heat nozzle.
Bad check valve.	Replace

Splay Marks

Problem	Solution
Obstruction in nozzle.	Remove nozzle and clean.
Screw rpm too high.	Decrease screw rpm.
Back pressure too low.	Increase injection back pressure.
Melt temperature too high.	Decrease temperature of plastic melt.
Nozzle too hot.	Reduce nozzle temperature.
Nozzle too small.	Replace with larger nozzle.
Gates too small.	Increase gate dimensions.
Sprue too small.	Replace with larger sprue.

Insufficient venting	Provide additional mold vents.
Burr in runner or gate.	Remove and clean.
Cracked mold.	Replace.
Trapped volatiles.	Increase venting.
Excessive moisture.	Test for moisture, increase drying time or temperature.
Resin contaminated.	Check supply, material handling system, and press; purge if necessary
Mold cavity contamination	Check for contamination (e.g. water or oil leaking into mold cavity)
Excessive shot size	Move mold to smaller shot size machine

Surface Finish (Low Gloss)

Problem	**Solution**
Inadequate polish or mold surface.	Prepare mold surface to give the gloss or texture expected for the molded item.
Material or mold too cold.	Increase cylinder temperature. Increase overall cycle time. Increase mold temperature.
Air entrapment.	Vent cavity at point of air entrapment.
Melt index of material too low.	If service requirement will permit use a higher flow resin.
Improper mold design.	Relocate gates to change flow pattern and reduce indication of turbulence in flow. The material should not be injected directly into the cavity, but should impinge on the mold surface.
Wrong injection pressure.	Adjust injection pressure.
Excessive injection speed.	Decrease injection rate.
Inadequate flow.	Increase cylinder and mold temperature, increase gate and cushion.
Contamination.	Check feed for foreign material.
Resin excessively moist.	Pre-dry material
Sprue, runners, and/or gate size too small.	Increase sprue, runners or gate size.
Pigment agglomerates.	Increase screw back pressure.
Oil or grease on knockout pins.	Wipe mold surface.

Surface Finish (Scars, Ripples, Wrinkles)

Problem	Solution
Inadequate injection pressure.	Increase injection pressure.
Inadequate injection speed.	Increase injection speed.
Excessive back pressure.	Decrease back pressure.
Cylinder temperature too low.	Increase cylinder temperature.
Cycle time too short.	Increase cycle time.
Inefficient feed allotment.	Adjust feed.
Injection forward time too long.	Reduce injection forward time.
Wrong mold temperature.	Adjust mold temperature.
Nozzle and metering zone temperature too high.	Reduce nozzle and metering zone temperature.
Presence of oil or mold lubricant on the mold.	Remove mold and clean.
Unsatisfactory location of gates.	Relocate gates.
Surface imperfections on the mold itself.	Polish mold; refinish if required.

Voids

Problem	Solution
Injection pressure too low.	Increase injection pressure.
Packing time too short.	Increase packing time.
Insufficient feed of material.	Increase feed allotment.
Mold temperature too low.	Raise mold temperature.
Injection speed too high.	Decrease injection speed.
Excessive cushion.	Decrease cushion.
At the side of a rib: rib too thick.	Reduce rib thickness.
Runner or gate too small or badly positioned.	Increase and/or improve dimensions. Relocated near heavy sections.

Warpage

Problem	Solution
Mold closed time too short.	Increase mold closed time.
Inefficient injection forward time.	Adjust injection forward time.
Ram speed too high or too low.	Analyze parameters and adjust injection speed accordingly.
Injection and holding pressure too high or low.	Analyze conditions; raise or lower as required.

Melt temperature inadequate.	Adjust cylinder temperature to match requirements for specific resin.
Excessive nozzle and metering zone temperatures.	Decrease nozzle and metering zone temperatures.
Mold temperature too high (for thick wall sections).	Lower mold temperature
Parts cool unevenly.	Correct mold temperature variation. Reduce variation in wall thickness. Fixture parts during post-mold cooling
Parts underpacked.	Increase feed.
Improper gate location.	Relocate gates to avoid thin sections, ribs, or curved sections.
Gate too restrictive.	Adjust gate dimension to improve flow of resin.
Unequal temperature between mold halves.	Equalize temperature of both halves of mold.
Non-uniform part ejection.	Observe mold for part ejection uniformity.
Parts mishandled after ejection.	Check handling of parts after ejection from mold.
Unbalanced gates on multiple-gated part.	Increase cylinder temperature.
Too many stresses in part.	Increase cylinder heat and decrease injection pressure.

Weld Lines

Problem	Solution
Material too cold.	Increase cylinder temperature to give optimum strength. Increase back pressure, change screw speed.
Injection speed too slow.	Increase injection pressure and speed.
Entrapment of air at weld line.	Vent cavities at parting line or weld point.
Improper mold design.	Relocate gates to change flow pattern and expel air from the mold. Increase the thickness in the weld line area or add a rib. Open the gate to remove restriction to flow.
Contamination or poorly dispersed pigments.	Check barrel, screw and non-return valve for contamination. Improve color dispersion by use of dispersion plug or compounded color.
Core shifting.	The positioning of the core should be checked to determine if a shift has occurred. This could cause thinning at the weld.
Mold temperature too low.	Increase mold temperature.
Injection speed too slow.	Increase injection speed.
Melt stock temperature too low.	Increase melt temperature
Injection pressure too low.	Raise injection pressure.
Insufficient mold venting.	Provide additional vents in mold.
Cylinder temperature too low.	Raise cylinder temperature.

Injection back pressure too low.	Increase screw back pressure.
Nozzle diameter too small.	Increase nozzle diameter.
Excessive screw flights in metering zone.	Use screw with shallower flights in the metering zone.
Improper gate locations and/or size.	Increase size and/or relocated as necessary.
Distance from gate excessive.	Decrease distance by using multiple gates and runners.
Ineffective flow pattern.	Change gate location to alter flow pattern.
Mold release agent (brittle weld lines).	Use smaller amount or change type.
Inadequate flow.	Increase cylinder temperature.

Instructions for Completing the Reject Sheet

Because rejected parts indicate a problem in the molding process, all rejected parts must be accounted for. When a part has a flaw, it is said to be a "reject" because it does not meet the quality guidelines from the customer. A certain number of rejects are to be expected. However, if the operator notices that there are a larger number of a particular flaw, he must alert the supervisor so that the supervisor can take corrective action such as adjusting the machine.

How do you know that the number of a particular reject is too high? You must keep track of them. One way to do this is to use a Reject Sheet. The Reject Sheet contains categories of the most commonly occurring defect problems. It also contains one blank category that allows the operator to write in a defect that is not listed.

Directions for completing the Reject Sheet:

1. Fill in the name (number) of the part at the top.
2. Fill in your shift number and today's date.
3. Write in the counter reading at the start of your shift (the counter reading is found on the machine).
4. Write in the counter reading at the end of your shift.
5. Write in the box number at the start of your shift.
6. Fill in the total of bad pieces during your shift (obtained by counting the number of defects marked in the boxes on this form).
7. Fill in the total number of good pieces during your shift (obtained by subtracting the total bad pieces from the total produced. The total produced is obtained by subtracting the start counter reading from the end counter reading.)
8. During your shift, make a mark (a small slash) in the category that corresponds to a defect each time you find a defect. If you should notice a large number of a particular reject, call your supervisor.
9. Check to be sure that all blanks at the top of the Reject Sheet have been completed.
10. Turn the Reject Sheet into the supervisor or to the appointed person at the end of your shift.

Project Future
Competency Area 1.0: Language Skills

Competency Number 1.3: Reading Work Related Forms and Charts

Lesson Number 1.3.4: Demonstrate Understanding of Material Safety Data Sheets (MSDS).

Lesson Objective: Given a Material Safety Data Sheet, the trainee will be able to correctly answer 7 out of 10 items on the post assessment.

Prerequisite Skill: The trainee must be able to read.

Literacy Skills: The trainee will read sentences and paragraphs.
The trainee will read information in spreadsheet form.
The trainee will write summary sentences.

Presentation:

I. Trainer will read the handout, Reading Material Safety Data Sheets, as the class listens. Trainer will use an overhead projector to read through the categories of an MSDS, explaining each section as it is read.

II. The trainees will be given an MSDS to study. They will use this sheet to complete the evaluation.

Evaluation: Trainee will complete the exercise, Understanding Material Safety Data Sheets.

Extension Activity: The trainees will use bus schedules to plan an emergency route to work.

F-P ID# - 107180

HUNTSMAN POLYPROPYLENE CORPORATION

AFFILIATE OF HCC HUNTSMAN CHEMICAL CORPORATION

#107180

MATERIAL SAFETY DATA SHEET

MSDS No. 5000

SECTION I NAME

PRODUCT Polypropylene (homopolymer*)

*Homopolymer grades: 5011, 5384, 5384S, ~~5520,~~ 5520M, 5520S, 5524, 5524S, 5550, 5550M, 5560S, 5610, 5820, 5820S, 5824, 5824S, 5864, 5911S, 5945S, 5B02, 5B03, 5B03S, 5B04, 5B04N, 5B04S, 5B04Z, 5B25, 5B25N, 5B25S, 5B25Z, (See Section VI)

CHEMICAL FAMILY Mixture - Polyolefin

24 HOUR EMERGENCY ASSISTANCE

HPC 800-423-7900
CHEMTREC 800-424-9300

HAZARD RATING

LEAST	0
SLIGHT	1
MODERATE	2
HIGH	3
EXTREME	4

HEALTH	0
FIRE	1
REACTIVITY	0

SECTION II INGREDIENTS

COMPOSITION	CAS No.	Percent
Polypropylene	9003-07-0	>99
Additives		<1

TOXICITY DATA

Acute Oral LD50	Not Available
Acute Dermal LD50	
Acute Inhalation LC50	

Based on data available to Huntsman, the components in this product are not hazardous under OSHA Hazard Communication Regulation (29 CFR 1910.1200).

CARCINOGENICITY	NTP	IARC	OSHA REGULATED
	Not Listed	Not Listed	No

SECTION III HEALTH INFORMATION

PRIMARY ROUTE OF ENTRY INHALATION

The health effects below are based upon component health effects consistent with requirements under OSHA Hazard Communication Regulation 29 CFR 1910.1200.

Eye Contact: product fines can cause mechanical irritation.
Skin Contact: product is unlikely to cause irritation.
Inhalation: product fines may cause mechanical irritation.
Ingestion: product is practically non-toxic.
Signs and Symptoms: irritation as noted above.
Aggravated Medical Conditions: pre-existing eye and respiratory disorders may be aggravated by exposure to product fines.

SECTION IV OCCUPATIONAL EXPOSURE LIMITS

No OSHA/PEL or ACGIH/TLV has been established.

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SECTION IX REACTIVITY

STABILITY ☐ UNSTABLE ☒ STABLE

HAZARDOUS POLYMERIZATION ☐ MAY OCCUR ☒ WILL NOT OCCUR

CONDITIONS AND MATERIAL TO AVOID

Strong oxidizing agents.

HAZARDOUS DECOMPOSITION PRODUCTS

At processing temperatures, some degree of thermal degradation will occur; although highly dependent on temperature and environmental conditions, a variety of decomposition products may be present ranging from simple hydrocarbons (such as methane and propane) to toxic/irritating gases (carbon monoxide and dioxide, acrolein, acids, ketones, aldehydes); see Special Precautions.

SECTION X EMPLOYEE PROTECTION

RESPIRATORY PROTECTION

Not ordinarily required.

PROTECTIVE CLOTHING

Not ordinarily required.

ADDITIONAL PROTECTIVE MEASURES

Adequate ventilation and/or engineering controls are required when product is heated in processing.

SECTION XI ENVIRONMENTAL PROTECTION

SPILL OR LEAK PROCEDURES

Shovel and sweep up or use industrial vacuum cleaner; avoid generating dust clouds; put into containers for reclaiming or disposal.

WASTE DISPOSAL

Place in an appropriate disposal facility in compliance with local regulations.

ENVIRONMENTAL HAZARDS

N.A.

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Reading Material Safety Data Sheets

OSHA requires that all employees be properly informed about all hazardous chemicals or materials present in the work place. You should receive a copy when you ask for it. *Your* company must adhere to these Right-To-Know Laws. The Material Safety Data Sheet (MSDS) is a document created by chemical or material manufacturers to explain the hazards that can occur when dealing with chemicals. The MSDS also explains how the chemical should be used, handled, and stored to prevent bodily harm. All set-up employees should know where these sheets are located in their company and have access to them.

Below is a list of the information included in an MSDS. In some cases, some of these topics are not required.

1. Chemical identification
2. Hazardous ingredients
3. Physical data (i.e., appearance, smell, etc.)
4. Fire & explosion data (i.e., flesh points, melt points, etc.)
5. Health hazards
6. Reactivity data (what other chemicals it reacts with?)
7. Spill or leak procedure – clean-up procedure
8. Special protective equipment required during use
9. Other special precautions.

Answer sheet

MATERIAL SAFETY DATA SHEET

OSHA requires that all employees be properly informed about all hazardous chemicals or materials present in the work place. You should receive a copy of the OSHA information when you ask for it. *Your* company must adhere to these Right-To-Know Laws. The Material Safety Data Sheet (MSDS) is a document created by chemical or material manufacturers to explain the hazards that can occur when dealing with chemicals. The MSDS also explains how the chemical should be used, handled, and stored to prevent bodily harm. All set-up employees should know where these sheets are located in their company and should have access to them.

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5. Health hazards
6. Reactivity data (what other chemicals it reacts with?)
7. Spill or leak procedure – clean-up procedure
8. Special protective equipment required during use
9. Other special precautions

Understanding Material Safety Data Sheets

1. What is the name of the company?

2. What is the product?

3. What is one of the emergency numbers?

4. What is the chemical hazard rating?

5. What are the ingredients of the produce?

6. According to OSHA, are the components in this product hazardous?

7. Is this product carcinogenic (cancer causing)?

8. What will happen if fines (tiny pieces) of the product get into your eyes?

9. What will happen if you ingest (eat or swallow) any of this product?

10. What protective clothing does this material require?

Bonus: Write a sentence or two to answer this important question.

How would you handle a spill or leak involving this product?

Project Future
Competency Area 1.0: Language Skills

Competency Number 1.3: Reading Work-Related Forms and Charts

Lesson Number 1.3.5: Interpret Production Schedules and Reports

Lesson Objective: Given a Production Schedule and a Production Report, the trainee will be able to locate 15 out of 20 bits of data requested on a post assessment.

Prerequisite Skills: The trainee must have the ability to read numbers.
The trainee must have an understanding of basic plastics terminology.

Literacy Skills: The trainee will read information in a spreadsheet format.
The trainee will locate and record information.

Presentation:

I. Trainees will study the Production Schedule as the trainer explains the categories located across the top of the sheet.

II. Trainees will study the Production Report as the trainer explains the categories located across the top of the sheet.

Evaluation: Using the Production Schedule, its accompanying memo, and a Production Report, the trainees will complete the exercise, Locating Information On Production Schedules and Reports.

Extension Activity: The trainees will use a shipping chart to determine the least expensive way to ship a package to a friend located in another city.

COMMENT SHEET

4/20 - 4/21

EVERYONE MUST WEAR SAFETY GLASSES.

NO HEADPHONES OR OPEN CONTAINERS ARE ALLOWED IN THE PRESS AREA.

ONE COLOR SPEC NO BIGGER THAN A PENCIL POINT IN VIEWING AREA IS PASSABLE. CLUSTERS OF COLOR SPECS, COLOR SWIRLS, OR BLACK BURNS ARE NOT PASSABLE PER FISHER PRICE.

1. Trimming must be done correctly. We've had someone over Rev-A-Shelf for 2 days trimming parts. Top corners must be trimmed. Had to retrim 2nd & 3rd's for a shipment today. Trimming has to be done correctly.

2. Drill press housing **MUST BE GAGED 100% BY OPERATOR.** Long gates, stress, grease & shorts are not passable. Watch stress around outer edges; use heat gun.

4. Pulls are not passable per Saft.

12. ALL stress must be heat gunned. Gates must be trimmed. Blades must be assembled correctly. Burrs on back wall must be scraped.

13. **DO NOT BOX** parts hot. # 13 & # 21 has to match color shade sample. Fisher Price molds other parts that these two presses have to match. (See sample for passable stress).

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16. Must have one right & one left taped together. Must have an air hose. No trimmings left on parts. Must trim all 3 gates on every part.

19. Keep an eye out for color swirls, arms length for 2 seconds. Watch warpage, maximum .100. Anything over this is **NOT PASSABLE**. Red Tag it, no shorts.

20. Drool at gates not passable. Partitions must gage. Excessive silver is not passable, use your best judgement. Make a decision. If running V2 material, mold needs cleaning every two hours per Johnson Controls.

21. **DO NOT BOX** parts hot. # 13 & # 21 has to match color shade sample. Fisher Price molds other parts that these two presses have to match.

22. Color shade of part does not matter, non-appearance part. Shorts, pin holes, and excessive flash are not passable. Correct packaging is a must. Leave 6 parts on table to cool before boxing (also a must). Shipping labels go on **RIGHT HAND SIDE** of boxes when looking at the fronts. Run per QC sheet. P.I.'s, do we have to use a half of roll of tape to close boxes? Be neat about your work.

23. Holes must gage per QC sheet. Watch for pulls, see not passable sample.

- **FLOOR PEOPLE, WHEN DUMPING REGRIND INTO A GAYLORD YOU MUST BLEND IT IN TO PREVENT BAD PARTS (SHORTS).**
- **READ THE QUALITY HISTORY COMMUNIQUE'S**
- *TURN GRINDERS AWAY FROM OPERATORS AND ALL GAYLORDS THAT HAVE MATERIAL IN THEM.*

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```
04-20-1995              PRODUCTION SCHEDULE              FOR DATE ____________
                                                              4/20- 4/21
OF  |MACH| PART | DESCRIPTION              | STD |PART    |RUNNER |RESIN|COLOR|COLOR|CARTON| NUMBER|PRI |MOLD |
OPLE| NO.| CODE |                          | CYC |WT/M    |GRAMS  | CODE|CODE |USAGE| SIZES|PCS/CTN|RUN |NUMB |
  |   |     |                              |     |        |       |     |     |  |  |      |       |    |     |
0 | 1 |RAS24 16591-11-1104-4115 A/  | 30| 111.00|  0.00|RPS41|CBR44| 1   |P0023 |  65 1/ 4| 1413| RUN 5000 PCS.THEN C/O TO WHITE.  LATE 1ST/EARLY 2ND....  **
0 | 1 |RAS23 16591-11-1104-4111 W/  | 30| 111.00|  0.00|RPS41|CWT37| 1   |P0023 |  65 1/9 | 1413| RUN 3500 PCS WHITE...24 HR. RUN...
0 | 2 |F1532 170077-9663 YEL PEGBD  | 47|1883.00|  0.00|RPS02|CYL29| 7   |P0105 |  12 14/ | 3837| BALANCING OF RUN FROM 021 THEN RUN 12500 PCS.
0 | 3 |RPS11 16591-11-1404-4111 W/  | 27| 275.33|  0.00|RPS41|CWT37| 1   |P0023 |  55 1/2 | 1307| RUN 6700 PCS...34 HR RUN...SHOULD C/O IN AM FRIDAY...  **
0 | 3 |RAS27 16591-11-1104-4118 T/  | 30| 111.00|  0.00|RPS41|CBR53| 1   |P0023 |  65 1/2 | 1413| RUN 3000 PCS.. OK TO OVERRUN TIL AM..
0 | 4 |SFT03 1805913901ED340/400C   |140|3770.00| 72.10|RAC13|CLEAR| 0   |P0100 |  48 1/1 | 2144| RUN 1200 PCS.  **
0 | 4 |DOWN0 DOWN                   |  1|   1.00|  0.00|R0029|R0002| 0   |00000 |   0 1/8 |    0| SAFT ED 120 SAMPLE RUN 75 PCS...
0 | 5 |CS07 RED COKE ENT. W/DOTS    | 45|2100.02|  0.02|RPE25|CRD49| 1.5 |P0065 | 230 1/0 | 1145| RUN 28 SKIDS...SHOULD GO DOWN LATE THIRD.  THEN PRESS FOR MAINT...
0 | 7 |HAM28 HAMILTON DIV.CLIP      | 25|   0.00|  0.00|     |     | 0   |P2002 | 200 1/5 |  243| RUN 3350 PCS.  (BLACK STYRENE)
5 | 8 |KDL29 143025 HOUSING         | 50| 956.39| 43.00|RPC12|NONE | 0   |P0003 |  25 1/6 |  645| RUN 6000 PCS.
0 | 9 |DOV09 14073/.840 VAPOR GUAR  | 40|  51.32|  3.50|RPC12|NONE | 0   |P0002 | 375 RW- | 2239| HOT START...RUN EARLY AM...NEED TO SHIP IN PM..  **
  | 10|PLE10 15" BRUSH BASIN        | 40| 395.46|  0.00|RSP29|CBR24| 2   |P0002 |  44 | 9 |  622| RUN 8200 PCS.
  | 11|AG05 BELT LINK HUMP/AQUA     | 45| 177.30| 37.30|RSP29|CRU41| 3   |P0002 | 600 | 8 | 2241| RUN 24 BELTS
0 | 12|F1587 170077-9423 ASSY TABL  | 43|2632.16|  0.00|RPS43|CGY02| 6   |P0105 |   6 | 2 | 4220| RUN 11200 PCS.THEN RUN 12500 PCS.
  | 13|DOWN0 DOWN0                  |  1|   1.00|  0.00|R0000|R0000| 0   |00000 |   0 13  |    0| MOLD 4626 RUN 22500 PCS...HOT TO SHIP IN AM...
  | 14|KDL27 137509 BODY            | 30|  62.00|  0.00|RABE8|CGY01| 1.3 |P0002 | 350 1A  |  649| RUN 2500 PCS..OK TO OVERRUN TO 5000 PCS TOTAL  **
  | 14|AG143 CLEARVIEW RETAINERS    | 27|  80.94| 14.20|RPS34|     | 0   |P0001 | 240 1/0 |  923| RUN 10600 PCS...28 HR RUN...
  | 15|KDL17 140949 LENS            | 75|  25.11| 53.50|RPC18|0    | 0   |P0001 | 704 1/3 |  452| RUN 2100 PCS.MIN.RUN ALL NIGHT  **
  | 15|KDL47 142169 BODY W/LENS     | 45| 217.40|  0.00|RPC10|CAL03| .6  |P3100 | 112 1/0 |    1| RUN 1000 PCS [illegible]
  | 16|F1556 170077-9558 LEG TAPER  | 41|2250.75|  0.00|RPS43|CRU01| 5   |P0105 |   8 | 5 | 3836| RUN 7120 PCS.THEN RUN 13500 PCS.
  | 17|F1504 SEAT 2331/PED 2493     | 30| 618.94|  0.00|RPP38|CBR55| 3   |P0109 | 134 | 6 | 4363| RUN 16000 PCS.THEN RUN 17200 PCS.
  | 18|F1556 HOCKEY FRAME R/L       | 45| 911.90|  0.00|RPP38|CYL04| 3   |P0105 | 167 15/0  3815| RUN 4000 PCS...-Should [illegible] 2ND [illegible]
  | 19|F1552 170066-5261/71/81      | 36| 938.32| 28.70|RPS43|CWT39| 3   |P0105 |  65 1/0 |13616| RUN 13500 PCS...
  | 20|JDC23 1110-16634 BATTERY     | 94|3401.32|  0.00|RCY23|NONE | 0   |P2131 |  96 1A  | 1418| RUN TILL TOLD TO STOP  WILL MATERIAL CHANGE TO V2 IF IT COMES IN  [illegible]  **
  | 21|F1530 CASTLE FRONT WALL      | 36| 534.14|  0.00|RPP38|CGY22| 3   |P0105 |  13 |  /1 4625| RUN 12449 PCS.
  | 22|GED07 116205683P003 WATER P  | 55|1046.26|  0.00|RPSY6|NONE | 0   |      | 120 1/7 | 1817| RUN 19040 PCS.  THEN RUN 10000 PCS.
  | 23|F1509 170091-0603            | 45|1951.54|  0.00|RPP38|CRD52| 3   |P0105 |  15 | 7 |13614| RUN 4200 PCS.THEN RUN 4200 PCS.
  | 24|DOWN0 DOWN0                  |  1|   1.00|  0.00|R0000|R0000| 0   |00000 |   0 |   |    0| MOLD SETS...4 14 15 9
```

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PRODUCTION REPORT FOR 08-JUL-95 SHIFT #1

MACH NO.	PART CODE	DESCRIPTION	AVG CYC	STD CYC	TOTAL SHOTS	OPTM PROD	ACT PROD	SCRAP PARTS	TOTAL LOSS	% SCRAP	% LOSS	HRS UP	DOLLARS SALES	$/ HR	SELLING PRICE	SCRAP DOLLARS
2	FISA1	70094-4051 F/-4061 R	33.8	36.0	845	1586	1708	0	0	0.0	0.0	7.9				
3	HUDA5	R5942 1 1/4 GREEN ST	50.5	45.0	557	1251	1107	7	144	0.6	11.5	7.8				
7	HAM03	10187535LH/10187548RH	40.9	42.5	650	625	492	158	133	24.3	21.3	7.4				
11	AFG07	BELT LINK FLAT AQUA	43.9	45.0	642	1251	1300	0	0	0.0	0.0	7.8				
13	FISB2	70089-8171 BASE/4623	39.4	40.0	731	720	718	13	2	1.8	0.3	8.0				
15	FISA6	70089-8252 RIGHT WAL	34.5	34.0	833	1690	1618	48	72	2.9	4.3	8.0				
19	FISB4	DECK/BALCONY/CHUTE	32.8	30.0	855	1870	1614	96	256	5.6	13.7	7.8				
20	FISB9	70091-0603/13614	44.8	45.0	643	640	645	0	0	0.0	0.0	8.0				
21	FISA2	CASTLE FRONT WALL	39.3	36.0	674	1470	1326	22	144	1.6	9.8	7.4				
23	FIS93	70075-3188 BODY W/VO	51.3	47.0	556	1215	819	293	396	26.3	32.6	7.9				

Shift Analyzation

Shift Total Scrap Dollars..........: $580.87
Shift Average Scrap Percentage....: 6.3%
Shift Scrap Percentage............: 5.3%
Shift Loss Percentage.............: 9.3%
Shift Machine Utilization.........: 42.4%
Shift Productivity................: 92.1%
Average Machine Rate.(Uptime Hrs).: $41.63
Total Machine Hours...............: 78.00
Total Dollar Sales................: $7,258.10
Total Dollars Contribution........: $3,247.11

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Locating Information on Production Schedules and Reports

Complete the following questions pertaining to the Production Schedule, the Comment Sheet, and the Production Report that you have been given.

True or False (Write True or False on the blanks)

_____1. Headphones and safety glasses are required.

_____2. Operators may pass color specs no bigger than a pencil point in the viewing area of a part.

_____3. Floor people must blend regrind when dumping it into a Gaylord.

_____4. All drill press housings must be gauged by the operator.

_____5. Hot parts must be boxed immediately.

Fill in the blanks.

Production Schedule:

6. The runner grams of KDL39 is ________________.
7. Machine number 24 is ___________________.
8. The standard cycle of FISA2 is ___________________.
9. Machine 18 will be running part number _________________ and part number ____________________.
10. The date of this schedule is ___________________.
11. The part code for the castle front wall is ____________________.
12. Part code FIS92 will be produced on machine number __________.

Production Report:

13. The average cycle for FISA1 is _______________.
14. The standard cycle for FISA1 is ________________.
15. The total number of shots for the castle front wall is _____________.
16. The shift total scrap dollars is ____________________.
17. The total machine hours are ___________________.
18. The total dollar contribution is ________________.
19. The number of hours up for machine 21 is __________.
20. The optimum production for FIS93 is __________________.

Project Future
Competency Area 1.0: Language Skills

Competency Number 1.3: Reading Work-Related Forms and Charts

Lesson Number 1.3.6: Understand Organizational Charts

Lesson Objective: Given an organizational chart, the trainee will be able to produce a flow chart of the production of a part.

Prerequisite Skill: The trainee must have the ability to read.
The trainee must have an understanding of basic plastics production.

Literacy Skills: The trainee will produce a flow chart.

Presentation:

I. Trainer will introduce the session by asking trainees to complete a family tree.

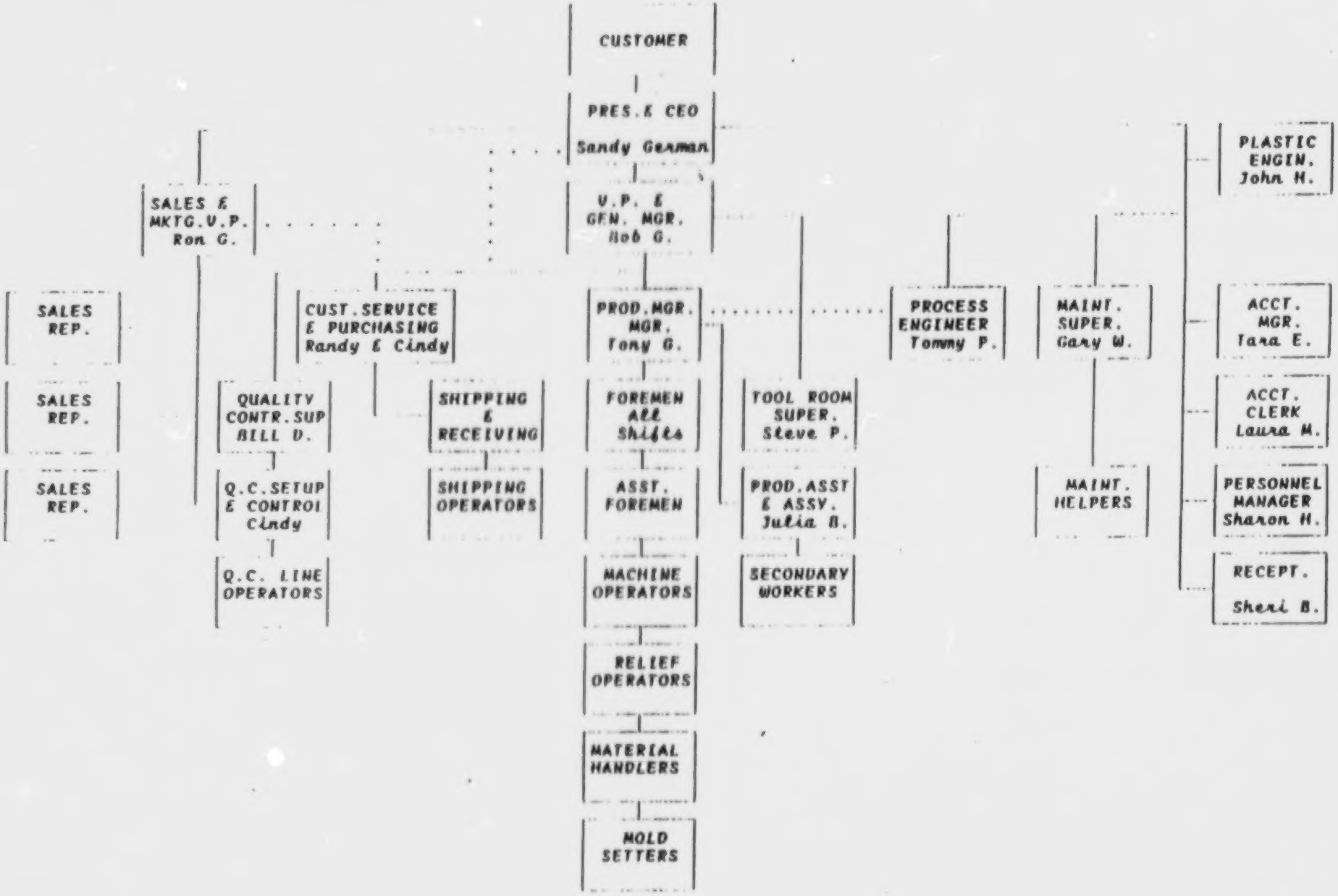
II. Trainer will explain that the family tree is a flow chart. The purpose of a flow chart is to show the relationship of parts to a whole. It also shows alternative routes if one event occurs over another. (If this happens, then this. But, if this happens, then this other action will occur.) Use the company organizational chart to show the relationship of the employees to various levels of management.

Evaluation: The trainees will work in teams of three or four to list the steps involved in creating a part--from the resin to the supplier. The trainees will create a flow chart demonstrating the production of the part.

Extension Activity: The trainees will read an article about any subject of interest to them. The trainees will create a flow chart of the possible reasons for reading an article.

ORGANIZATION CHART

FUTURA PLASTICS & ENG., INC.


CUSTOMER
PRES. & CEO Sandy Gearman
V.P. & GEN. MGR. Bob G.
SALES & MKTG. V.P. Ron G.
SALES REP.
SALES REP.
SALES REP.
CUST. SERVICE & PURCHASING Randy & Cindy
QUALITY CONTR. SUP BILL D.
Q.C. SETUP & CONTROL Cindy
Q.C. LINE OPERATORS
SHIPPING & RECEIVING
SHIPPING OPERATORS
PROD. MGR. MGR. Tony G.
FOREMEN All Shifts
ASST. FOREMEN
MACHINE OPERATORS
RELIEF OPERATORS
MATERIAL HANDLERS
MOLD SETTERS
TOOL ROOM SUPER. Steve P.
PROD. ASST & ASSY. Julia B.
SECONDARY WORKERS
PROCESS ENGINEER Tommy P.
MAINT. SUPER. Gary W.
MAINT. HELPERS
PLASTIC ENGIN. John H.
ACCT. MGR. Tara E.
ACCT. CLERK Laura M.
PERSONNEL MANAGER Sharon H.
RECEPT. Sheri B.

11/11/94

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Project Future
Competency Area 1.0 : Language Skills

Competency Number 1.3: Reading Work Related Forms and Charts

Lesson Number 1.3.8: Demonstrate Understanding of Performance Appraisal Forms and Employee Warning Notices

Lesson Objective: Given a Performance Appraisal Form, the trainee will be able to complete a self-appraisal of himself/herself. The trainee will participate in classroom discussion of Employee Warning Notices.

Prerequisite Skills: The trainee must be able to read.
The trainee must be able to add simple numbers, using a calculator or pencil.

Literacy Skills: The trainee will read sentences.
The trainee will add one- and two-digit numbers.
The trainee will apply standards of behavior to him/herself.
The trainee will use appropriate speech skills during open discussion.

Presentation:

I. The trainer will introduce the session by asking trainees to define performance as trainer writes the definition on the board. The trainees will define review in the same manner. The trainer will lead trainees to determine both a definition for and a purpose for performance reviews.

II. Using a blank copy of the company's current Performance Appraisal, the trainer will have trainees read through the form and underline any words of which they are unsure. After all trainees have had an opportunity to read through the form, the trainees will call out words they have underlined. The trainer will lead trainees to define and explain these words.

III. Using copies of a blank Employee Warning Notice, the trainer will lead trainees in a discussion of the types of offenses that may cause a warning to be issued. Company procedures for handling the warnings should be discussed. Caution: This must be handled with care.

Evaluation: Trainees will use the Performance Appraisal Form to complete a self-assessment of their performance.

Extension Activity: The trainees will design a form to evaluate the performance of an automobile.

PERFORMANCE APPRAISAL FORM - HOURLY

Name of Employee________________________________**Job Title**______________________________

Immediate Supervisor____________________________________**Title**________________________

Date______________**Current Pay Rate**___________**Date of Hire**____________________________

TYPE OF REVIEW: • 6 Months • 1 Year • 18 Months • 24 Months • Other

POLICY: Every employee will be given a periodic evaluation of his/her job performance.

GUIDELINES TO THE RATER:

1. Performance appraisals are essential to the growth and development of every employee. Your employee wants and needs the information you can provide, to assist in improving performance.
2. Remain as objective as possible.
3. Be frank and open as you go over this appraisal with the employee. Encourage questions and make recommendations.

INSTRUCTIONS TO THE RATER:

Check the behavioral characteristics that most clearly describe the employee job performance.

1. **Job Knowledge:** (the mastery of the skills and training to do the job)

____(0) Weak in basic knowledge needs for the job. Frequently needs assistance.

____(05) Job knowledge adequate to get by. Requires some assistance regularly.

____(10) Knows job reasonably well. Can handle some complex and unusual aspects of the job with some effort.

____(15) Has above average knowledge of the job. Know what to do and how to do it.

____(25) Job knowledge is excellent. Exceptional handling of unusual and complex aspects of the job. Often consulted by others for assistance.

EXAMPLE/COMMENT____

2. **Quantity of Work:** (the amount of work produced)

____(0) Lacks basic skill for job. Little desire for improvement. Frequently slows down the work flow.

____(05) Work output is low. Needs improvement in skill, work knowledge. Has difficulty adapting to new work.

____(10) Works at a moderate speed. Needs some encouraging and urging. Has good output on repetitive work.

____(15) Works fast and skillful. Understands the best method for turning out work. Does his/her share when working with others.

____(20) Exceptionally fast and accurate; works the quickest best way. A high producer who does more than his/her share when working with others.

EXAMPLE/COMMENT____

3. **Quality of Work:** (the level of accuracy and neatness of the work produced)

____(0) Frequently makes mistakes; has acceptable quality on repetitive work.

____(5) Often makes mistakes; work is below acceptable standards.

____(10) Work needs comparatively little checking. Acceptable quality.

____(15) Checks own work; seldom makes mistakes. Does neat, accurate work.

____(25) Work can always be relied upon for neatness and accuracy.

EXAMPLE/COMMENT____

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9. **ATTENDANCE and PUNCTUALITY** (habits of absence,tardiness, and leave early)
To be completed by Personnel Dept.

______(0) Absent,late,leave early 6 or 7 times in a 6 month period.

______(25) Absent, late,leave early 4 or 5 times in a 6 month period.

______(35) Absent, late,leave early 3 times in a 6 month period.

______(50) Absent, late,leave early 1 or 2 times in a 6 month period.

EXAMPLE/COMMENT ______________________________

OVERALL EVALUATION: (list point totals here ______.)

0-60 **UNACCEPTABLE.** This employee is either unwilling or unable to meet the standards of this job and should be separated from employment.

61-105 **BELOW STANDARD.** This employee needs major improvement to be successful on the job. An action plan for improvement and evidence of desire to improve is essential.

106-155 **AT THE STANDARD.** The performance and attitude of this employee is at an acceptable level. **SPECIAL NOTE:** Regardless of how the employee scores on Items 1-8, in order to be considered **At the Standard**, the score on **Attendance** must be 25 or higher. If the score on Attendance is lower than 25, the employee will be considered **Below the Standard.**

156-210 **ABOVE THE STANDARD.** A good worker, continues to produce quality and consistent work.

211-250 **EXCELLENT.** A key employee; consistently produces above the expectation. A candidate for promotion when a suitable vacancy is open.

MAJOR STRENGTHS:______________________________

____

MAJOR WEAKNESSES:______________________________

____

SUGGESTIONS FOR IMPROVEMENT:______________________________

____

____

____

SIGNATURE OF SUPERVISOR:______________________________**DATE:**____________

SIGNATURE OF MANAGER:______________________________ **DATE:**____________

COMMENTS BY THE EMPLOYEE: (Please feel free to comment on the Performance Review here)

____

____

____

____

Your signature below is an acknowledgement that you have seen this evaluation and it has been discussed with you. It in no way implies agreement with the appraisal.

EMPLOYEE SIGNATURE______________________________**DATE:**____________

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EMPLOYEE WARNING NOTICE

FUTURA PLASTICS
& ENGINEERING, INC.

OYEE		WARNING DATE / /
LOYEE NO.	DEPARTMENT	SHIFT

VIOLATIONS

☐ ATTENDANCE
☐ CARELESSNESS
☐ CONDUCT
☐ INSUBORDINATION
☐ PERSONAL WORK
☐ REFUSAL TO WORK OVERTIME
☐ SAFETY
☐ TARDINESS
☐ UNAUTHORIZED ABSENCE
☐ WORK QUALITY
☐ WILLFUL DAMAGE TO COMPANY PROPERTY
☐ OTHER ____________________

WARNINGS PREVIOUSLY

WARNING #	DATE	ORAL	WRITTEN	SIGNED
1				
2				
3				

COMPANY STATEMENT

SIGNED

TITLE

DATE / /

EMPLOYEE STATEMENT

☐ I agree with Company Statement.

☐ I disagree with Company Statement.

REASONS

SIGNED

DATE / /

ACTION TAKEN

I have read this Warning Notice and understand it.

EMPLOYEE'S SIGNATURE ____________________ DATE __________

SUPERVISOR ____________________ DATE __________

☐ This form was refused by Employee

S ERVISOR ____________________ DATE __________

* If the Employee Warning Notice, after completion, contains information on the medical condition or history of an employee, then it must be maintained in a separate medical file and treated as confidential in accordance with applicable law and regulations.

Adams
0080
Jan '92

Employee Warning Notice

Project Future
Competency Area 1.0: Language Skills

Competency Number 1.3: Reading Work-Related Forms and Charts

Lesson Number 1.3.9: Interpret and Complete a Bill of Lading--Short Form

Lesson Objective: Given a sheet of information and a blank Bill of Lading, the trainee will be able to complete the Bill of Lading.

Prerequisite Skills: The trainee must be able to read.
The trainee must have some familiarity with shipping numbers.

Literacy Skills: The trainee will categorize information by placing it in the correct spot on the form.
The trainee will calculate the number of parts in the shipment.

Presentation:

I. The trainer will introduce the session by asking how the product gets from the company to the customer.

II. Trainees will study the handout, Completing Bills of Lading, as the trainer explains the terms on the Bill.

Evaluation: Trainees complete a blank Bill of Lading using the information contained on the handout, Bill of Lading Exercise. Trainer will check the trainees' work for accuracy.

Extension Activity: The trainee will select a piece of merchandise from a mail-order catalogue and will complete the Order Form.

Completing Bills of Lading

Name of Carrier. Fill in the name of the carrier – UPS, CTI Trucking Company, Avery, etc.

Shipper Number. This is the number the carrier has assigned to the company.

Carrier Number. This is the number the company has assigned to the carrier.

Date. Put in the shipping date.

To: Consignee (customer), Street, Destination (city and state), zip code. This is the names and address of the customer company – General Electric, Fisher Price, etc.

From: This is the name and address of the company that is shipping the product. This would be your company's name and address. Do include a telephone number.

Number of ship units. This is the number of boxes or crates being shipped.

Kind of Packaging, description of articles. This is where you identify what is being shipped. This description must be one that the shipping company (your company), the consignee (receiving company) and the carrier (trucking or postage company) can understand. Write in the number of pieces (obtained by multiplying the number of pieces in each box or crate by the total number of boxes or crates). Also write in the part code, the part number, and the description of the article – *red swing bottom, black water pan, etc.* Write in the number of crates or boxes times the number of parts in each. This equals the total number of pieces (show your math). Leave some space; then record the customer P.O. (Purchase Order) number.

Weight. Weigh the shipment on the scale and place the total weight here.

Class. This is the rate obtained from a chart provided by the carrier (trucking company or postal service).

Charges. Record any charges from a rate chart provided by the carrier. . Check to be sure that the company has not pre-paid. If the company has pre-paid, leave this column blank or write in pre-paid.

Freight charges. Write in whether the shipment is pre-paid (your company pays); C.O.D. (Cash On Delivery – very rarely used); or Collect (the consignee or customer pays).

Bill Of Lading Exercise

Name of Carrier: Overnight Express

Shipper Number: 10243-5-15589

Carrier Number: 1231232123

Date: Today's date

To: Plymouth Products, 123 W. Forty-Sixth Street, Plymouth, MA 45687

From: Futura Plastics and Engineering, Inc., 1920 Watterson Trail,
Louisville, KY 40299, (502) 491-8833.

Number of ship units: 46 boxes

Kind of Packageing, description . . . :
Number of pieces--3956
Part code--PLY89C
Part number--134C1598 P559
Description--Blue caps
46 boxes at 86 each = 3956

Weight: 1650

Class: 15

Charges: Pre-paid

ALTERNATE STRAIGHT BILL OF LADING — SHORT FORM

CTI (Name of Carrier)

Shipper No 10149-3-15235
Carrier No.
Date 12/09/96

TO:
Consignee GENERAL ELECTRIC
Street 301 N CURRY PIKE
Destination BLOOMINGTON, IN **Zip Code** 47401

FROM:
FUTURA PLASTICS & ENGINEERING, INC
1920 WATTERSON TRAIL
LOUISVILLE, KENTUCKY 40299
(502) 491-8833

O CALL FOR APPOINTMENT:

UMBER OF SHIP UNITS	KIND OF PACKAGING, DESCRIPTION OF ARTICLES SPECIAL MARKS AND EXCEPTIONS	WEIGHT (SUBJ. TO CORR.)	CLASS	CHARGES
23	#PCS=3726 GEN06B 162D5683 P003 BLACK WATER PAN 23 crates at 162 each = 3726 CUSTOMER P.O. C109471	7100	77.5	

EMIT C.O.D. TO:

.O.D. AMT. $	**C.O.D. FEE: PREPAID ☐ COLLECT ☐ $**	**TOTAL CHARGES: $** 0.0
Note — Where the rate is dependent on value, shippers re required to state specifically in writing the agreed or eclared value of the property. The agreed or declared value of the property is hereby pecifically stated by the shipper to be not exceeding. $ per	Subject to Section 7 of the conditions, if this shipment is to be delivered to the consignee without recourse on the consignor, the consignor shall sign the following statement. The carrier shall not make delivery of this shipment without payment of freight and all other charges. X ______ (Signature of Consignor)	FREIGHT CHARGES COLLECT

RECEIVED, subject to the classifications and lawfully filed tariffs in effect on the date of the issue of this Bill of Lading, the property described above in apparent good order, except as noted (conte nd condition of contents of packages unknown), marked, consigned, and destined as indicated above which said carrier (the word carrier being understood throughout this contract as meaning any per corporation in possession of the property under the contract) agrees to carry to its usual place of delivery at said destination, if on its route, otherwise to deliver to another carrier on the route to estination. It is mutually agreed as to each carrier of all or any of said property over all or any portion of said route to destination and as to each party at any time interested in all or any of said proper nat every service to be performed hereunder shall be subject to all the bill of lading terms and conditions in the governing classification on the date of shipment.

Shipper hereby certifies that he is familiar with all the bill of lading terms and conditions in the governing classification and the said terms and conditions are hereby agreed to by the shipper and accep r himself and his assigns.

SHIPPER **PER**	**CARRIER** **PER** **DATE**

1. Original **2. Carrier Copy** **3. Packing Slip** **4. Copy** **5. Copy**

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ALTERNATE STRAIGHT BILL OF LADING — SHORT FORM

(Name of Carrier)

Shipper No
Carrier No
Date

TO:
Consignee
Street
Destination **Zip Code**

FROM:
FUTURA PLASTICS & ENGINEERING, INC
1920 WATTERSON TRAIL
LOUISVILLE, KENTUCKY 40299
(502) 491-8833

TO CALL FOR APPOINTMENT:

NUMBER OF SHIP UNITS	KIND OF PACKAGING, DESCRIPTION OF ARTICLES SPECIAL MARKS AND EXCEPTIONS	WEIGHT (SUBJ. TO CORR.)	CLASS	CHARGES

REMIT C.O.D. TO:

C.O.D. **AMT. $**

C.O.D. FEE: **PREPAID** ☐ **COLLECT** ☐ **$**

TOTAL CHARGES: **$**

Note — Where the rate is dependent on value, shippers re required to state specifically in writing the agreed or eclared value of the property.
The agreed or declared value of the property is hereby pecifically stated by the shipper to be not exceeding

$ per

Subject to Section 7 of the conditions, if this shipment is to be delivered to the consignee without recourse on the consignor, the consignor shall sign the following statement.
The carrier shall not make delivery of this shipment without payment of freight and all other charges.

X ______________________
(Signature of Consignor)

FREIGHT CHARGES

RECEIVED, subject to the classifications and lawfully filed tariffs in effect on the date of the issue of this Bill of Lading, the property described above in apparent good order, except as noted (conte
d condition of contents of packages unknown), marked, consigned, and destined as indicated above which said carrier (the word carrier being understood throughout this contract as meaning any pers
corporation in possession of the property under the contract) agrees to carry to its usual place of delivery at said destination, if on its route, otherwise to deliver to another carrier on the route to s
stination. It is mutually agreed as to each carrier of all or any of said property over all or any portion of said route to destination and as to each party at any time interested in all or any of said proper
at every service to be performed hereunder shall be subject to all the bill of lading terms and conditions in the governing classification on the date of shipment.
Shipper hereby certifies that he is familiar with all the bill of lading terms and conditions in the governing classification and the said terms and conditions are hereby agreed to by the shipper and accept
himself and his assigns.

SHIPPER
PER

CARRIER
PER **DATE**

1. Original **2. Carrier Copy** **3. Packing Slip** **4. Copy** **5. Copy**

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Project Future
Competency Area 1.0: Language Skills

Competency Number 1.4: Reading Work-Related Materials Critically

Lesson Number 1.4.1.: Interpret Workplace Announcements and Notices

Lesson Objective: Given a copy of a company memo, the trainee will be able to answer eight of ten questions about information contained in the memo.

Prerequisite Skill: The trainee must be able to read sentences.

Literacy Skills: The trainee will read memos and write summary sentences. The trainee will demonstrate group roles and working in a group to accomplish a task.
The trainees will list and define new vocabulary words.

Presentation:

I. Prior to beginning instruction, the trainer will gather several sample memos and other notices from the company bulletin boards and from the Human Resources Department.

II. Trainer will explain that one of the most important ways a company communicates with its employees is through the use of memos and notices. Ask trainees to name the ways that the company distributes these important communications. The trainees may mention the following: placing them in the envelope with paychecks, posting them in a prominent place such as the break room or near the time clock, having the supervisors hand them to each employee, or by mailing them to every employee. Ask trainees to rank these as to possible importance the memo or notice would have if delivered in each way.

III. The trainer will break the class into teams of three and will distribute one copy of a memo to each team. The teams are to summarize, in no more than three sentences, what their memo says. Have each team appoint a recorder, a reporter, and a timekeeper. Ask the trainees to list any words that might be confusing to new employees. These words might include plastics-specific vocabulary, jargon, or acronyms. The trainer may have to define these terms for the trainees and give examples.

IV. The trainees report to the large group. The trainer will list any unfamiliar vocabulary words or terms on the board and will ask the group to define them.

Evaluation: Using a different memo and a bulletin board notice, trainees will complete the exercise, Interpret Workplace Announcements and Notices.

Extension Activity: The trainees will write a memo to a local hospital concerning an error in a bill they have received.

Interpret Workplace Announcements and Notices

Who is the audience of the memo?

Who sent the memo?

When was the memo sent?

What is the purpose of the memo?

What is the tone of the memo? (Is the subject of the memo urgent?)

Summarize the memo:

____

____

____

____

____

Why would the sender use a memo rather than a letter?

Why would the sender use a memo rather than telling an employee the information in person?

Project Future
Competency Area 1.0: Language Skills

Competency Number 1.4:	Read Work-Related Materials Critically
Lesson Number 1.4.2:	Locate Information in Manuals and Summarize Main Idea
Lesson Number 1.4.2.1:	Locate Information in an *Employee Guidebook*
Lesson Objective:	Given a copy of the *Employee Guidebook*, the trainee will be able to correctly complete 15 out of 20 questions about information contained in the *Guidebook*.
Prerequisite Skills:	The trainee must be able to read simple sentences. The trainee must be able to summarize information.
Literacy Skills:	The trainee will use critical reading skills to locate information quickly. The trainee will demonstrate problem-solving skills. The trainee will write summary sentences.

Presentation:

I. Before class, the trainer will select an outgoing trainee to act out a scenario of a crisis. After the skit, the trainer will ask the employees how they would deal with it. How do they know that this is the proper procedure? How can they find out? (Look in the Employee Guidebook.) Will they have time to read the whole thing in a crisis? (No, they will have to develop a way to find the information quickly.)

Crisis: You awake half an hour later than usual because your alarm clock did not go off. You can still make it to work on time if you skip breakfast and a shower. You run out the door with shoelaces untied and buttoning the last button on your shirt. You hop into your car. You turn the key--crank, crank, crank, crank--nothing happens. OH, NO! You forgot to get gas yesterday. You **will** be late. What will you do?

II. Using the *Employee Guidebook* and the handout, Critical Reading for a Purpose, the trainer will discuss the strategies for finding information quickly. Trainer must instruct trainees to:

Look for:

- the titles and headlines
- items that are in bold type or underlined
- topic and summary sentences of paragraphs
- bulleted items
- italicized words

Evaluation: Trainees will complete the questions on the handout by writing summary sentences after locating the information in the *Employee Guidebook*. Trainees will self-score their responses.

Extension Activity: The trainer will prepare "3 X 5" cards with computer problems on them. The trainees will use the manuals that came with the classroom computers to locate a solution for the problem on their cards.

EMPLOYEE GUIDEBOOK

FOR

PROBATIONARY EMPLOYEES

FUTURA PLASTICS & ENGINEERING, INC.
1920 Watterson Trail
Bluegrass Industrial Park
Louisville, KY 40299
502-491-8833

ABOUT THIS GUIDEBOOK

This guidebook was created to summarize our policies, procedures and work practices. We created it to serve as a guide to you, our employee. This booklet outlines the Company policies that will serve as a guide to you while working for Futura. Please read this booklet carefully in order to understand how your Company operates. Remember that information listed here is only a summary. It is not a written or implied contract of employment. Additional information can be obtained from your Supervisor or from the Personnel Department.

From this guidebook you will learn about your responsibilities as an employee and what you can expect from the Company. From time to time we change the policies. We will supply you with new information as it occurs, so it is important to remember that the most recent information is the information to follow. When you are uncertain, please ask. It will help you and the Company avoid many misunderstandings.

For employees who have completed their probationary period and are members of the bargaining unit representing Futura employees, the contract supersedes information found here.

ABOUT THE COMPANY

Futura Plastics & Engineering, Inc. is a manufacturing company. We produce plastics products such as display racks and plastic toys for children. The Company is privately owned and has been in business since 1978. It is our policy and practice to select employees on the basis of job-related qualifications and potential for growth. We are an Equal Opportunity Employer. Our ability to continue our operations, remain competitive and grow, depends on our willingness to work together and produce the highest quality product at a competitive price, on time, for our customers.

TO ALL NEW EMPLOYEES

As an employee at Futura Plastics & Engineering, Inc. you need to know:

- Our Company operates continuously, 24 hours a day, 7 days a week, with three shifts.
- Our employees work shifts with rotating days off.
- To work here, you must be willing to work shifts that may include some days, nights, and weekends.
- You are employed for fulltime work.
- Our regular workday is eight (8) hours.

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decision about you. You should not assume you will be accepted for regular work. The probationary period is a very important and necessary time for us to make a decision about regular employment.

UNION MEMBERSHIP

When you join the Union, you will be required to pay $10.00 initiation fee (a one-time payroll deduction). You will also be required to pay $12.00 per month in Union dues, through payroll deduction. Membership in the Union is mandatory once you pass your probationary period.

YOUR SUPERVISOR

Every Futura employee is an individual and will be treated as one. You will be assigned to a Supervisor who will become your main source of information and assistance. It is the responsibility of your Supervisor to train you and to treat you fairly. The Supervisor will be the person to help resolve problems and explain policies that are not understood. Your Supervisor will be vitally interested in helping you do the best possible job. The *success* of your Supervisor is a direct result of your *success*.

YOUR PERSONNEL DEPARTMENT

The Personnel Department is always interested in the needs of our employees. Your records are stored there and changed whenever you have a change in status. The Personnel Representative is interested in helping you solve problems. Whenever you have a problem that you are unable to talk over with your Supervisor, feel free to discuss it with a member of the Personnel Department.

Employees who recognize the presence of a personal problem from alcohol and/or substance abuse and who wish to seek help, may contact the Personnel Representative for assistance in referral to a Community resource.

PARKING

The Company has limited parking facilities. We make every effort to protect the vehicles parked there, but parking is at your own risk. Futura is not responsible for loss or damage to property left in our parking lots. Please park in the gravel lot at the rear of the building. Do not park in the front, around the loading docks, or in the lot of the Company next door. Drive slowly entering and leaving the parking area.

LOSS OF PROPERTY

We all share the responsibility for protecting and preserving employee and Company property. It is important that you protect your personal property, and take particular care not to leave a handbag or wallet in your coat or in a highly visible area, unattended. Although the building is not open to the public, many visitors enter and leave the building every day. The Company cannot accept responsibility for the loss of your personal property. It is unwise to bring valuable per-

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TIMECARDS

The timecard is our official record of the hours you work. We are required, by law, to keep time records. You are assigned a timecard and are required to "clock in" when you report for work and "clock out" when you leave Company property, except when you are on official Company business. You are required to punch out and punch back in from lunch period. Our Payroll accountants needs an accurate record of all the hours you have worked in order to pay you properly.

You may not record time on the timecard of another employee or have another employee record time on your timecard. It is an act of dishonesty and may result in disciplinary action, including discharge. Timecards must be kept in the designated timecard rack at all times.

If you have any problem with your timecard, bring the card to the Personnel Office for assistance. Whenever you make a mistake on the card, forget to punch in or out, or work outside your regular hours, your card must be initialed by a member of management and by you.

BREAKS AND LUNCH PERIODS

All employees must take a two (2) ten (10) minute breaks during the eight (8) hour shift. You are not required to punch out for a break, but you are on your "honor" to take only ten minutes. Remember that someone else is waiting to take a break when you return.

Take your break and lunch in the break room only. Employees on break or lunch in other areas of the building, except the break room or restroom, will be subject to warnings for loitering.

You are required to punch out for lunch. The lunch period is ~~20~~ 30 minutes. Once again, you must remember that others are waiting to have lunch and you cannot overstay your lunch period.

Do not work through your lunch period without authorization from your Supervisor. If you work longer than you are authorized, you must have your timecard approved.

REPORTING ABSENCES

When you must be late or absent, you must notify us as quickly as possible. Notification prior to shift listed below is as follows:

- 1st Shift - notify by 6:30 a.m.
- 2nd Shift - notify by 12:00 p.m.
- 3rd Shift - notify by 3:00 p.m.

Be certain to obtain the name of your supervisor, in case you need to call to report your absence. In all cases, you must make every effort to contact your Supervisor. Do not leave a message with whomever answers the telephone.

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- Our customer gets the highest quality product we can produce, at a fair price. Our competitive business environment demands it.

- Our fellow employees work in a safe environment and have the opportunity to enjoy their jobs.

If you violate our work rules or established policies, you will be subject to discipline. Our discipline procedure is designed to reestablish your positive relationship with the Company. It may include oral warnings, written warnings, or discharge. You will receive a copy of any written disciplinary action taken so you can be certain you understand the problem that caused the disciplinary action to be necessary, and to serve as a reference for improvement.

It is always our desire to avoid termination, although termination may be the appropriate disciplinary action to take. We generally find there are two primary causes for discipline ... unsatisfactory performance and violation of work rules.

WORK RULES

These are examples of work rule violations. Any disciplinary action, prior to discharge, should be heeded immediately, as the severity of these offenses can certainly place your job in jeopardy.

> This is not intended to be an all inclusive list, but rather examples of rule violations. In any corrective action, the employee's entire work record will be studied and considered. Violations of the accepted standard of conduct here, may bring discipline up to and including discharge from our employ.

Our goal is to assist all employees in the maintenance of a positive relationship throughout their career at Futura.

GENERAL RULES AND ACCEPTED BEHAVIOR FOR ALL EMPLOYEES

- All employees are expected to give their full effort to the job. Deliberately slowing down or ignoring the production standards is unacceptable here.
- When no work is available, employees are expected to clean and sweep their work areas.
- Every employee is expected to help keep the restrooms and breakrooms clean.
- Resin, color, or equipment must be handled carefully to avoid loss or damage.
- All production must be checked and every box must have a name tag in it.
- Employees can expect to be sent home after four hours, when no work is available.
- Employees who have knowledge of thefts, shortages, or wrongdoing on Company

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FUTURA'S SAFETY POLICY

There is no area of activity of greater importance to Futura than SAFETY. We believe that all work-related injuries and illnesses can be prevented.

SAFETY is everyone's responsibility EVERYDAY. Like the profitability of our Company and the quality of our products, safety must be fostered by continuous control efforts, teamwork, and innovation. Experience has proven that success of even the most complete safety programs are dependent on the attitudes and working habits of each individual employee.

"SUCCESS OF OUR SAFETY PROGRAM REQUIRES PARTICIPATION OF EVERY MEMBER OF THE FUTURA TEAM"

While the Company has the primary responsibility for establishing safety policies and procedures, it is the responsibility of all employees to work in a safe manner. This requires the cooperation and commitment of everyone.

WE BELIEVE:

- PEOPLE are our most important asset, and we must protect them.
- SAFETY is a condition of employment. Each employee has responsibility for working safely.
- All operating and construction exposures that may result in injuries or illnesses can be controlled.
- All deficiencies must be corrected promptly. Without prompt action to rectify deficiencies the risk of injury increases, and the credibility of the safety program will suffer.
- It is necessary to train all employees to work safely and to understand that it is to their advantage as well as the Company's to work safely; further, that they have a definite responsibility to do so.
- It is good business to prevent personal injuries and occupational illnesses. Accidents cost us all.
- It is EVERYONE'S responsibility to prevent accidents andmaintain a safe working environment.
- The safe operation of our plant is a team effort. Upon acceptance of employment, all employees are required to work and conduct themselves in a safe manner, and maintain a clean, safe, and orderly area.

2. Keep your work area clean. Place all scrap, rags, trash and oily waste, in the appropriate containers provided for that purpose.

4. Do not allow anyone except trained and authorized personnel to treat any injury.

FIRE RULES

1. Become familiar with all emergency exits and emergency equipment.

2. Fire extinguishers are located throughout the plant. Familiarize yourself with the locations of the fire extinguishers nearest your station.

3. All flammable liquids must be kept in approved containers, and the containers labeled to identify the contents.

4. Rags saturated with flammables must be kept in closed containers approved for that use.

5. Never pour oil, flammable liquid, or any chemical into any sewer or drain.

6. Smoking is prohibited in restricted areas. All areas of the plant are restricted except the breakroom and the restroom.

REMEMBER THAT THE KEY TO AVOIDING ACCIDENTS AND INJURY STARTS WITH YOU. SAFETY AWARENESS EVERYDAY ON THE JOB.

BUILDING EMERGENCIES

When the emergency signal is sounded indicating a fire, fire drill, tornado, or other emergency, you must stop your work, stop the equipment you may have running, and calmly file out of the building through your designated exit route, or to your designated shelter area. This route will be assigned to you by your Supervisor.

Employees with the appropriate knowledge and skills will be responsible for shutting off the electricity, gas, and air. Follow all instructions issued by your Supervisor or other personnel assigned responsibility in emergency evacuation or disaster control. (See the bulletin board for evacuation information)

FUTURA PLASTICS

ABSENTEE CONTROL PROGRAM

A. The new absentee year will begin on date of hire and continue hire date to hire date. An "Absence" is an occurrence less than 7 hours.

B. All employees will be allowed up to nine (9) days of personal absence without pay per anniversary year. An employee is required to call in one (1) hour before the start time. Days of personal absence will be pro-rated in accordance with his or her date of employment as follows:

12 months -	Nine (9) days of personal absence
9 months -	Seven (7) days of personal absence
6 months -	Five (5) days of personal absence
3 months -	Three (3) days of personal absence

C. Over the 12 month period of Item A above, an employee has not reached the fourth step of Item F hereof will be allowed nine (9) days of personal absence without pay for the succeeding year. Personal days will not carry over, or accumulate from one year into the succeeding year. Disciplinary action will not carry over into the succeeding year.

D. Once an employee has taken nine (9) days of personal absence without pay each contract, that employee will be subject to the Absentee Control Program discipline as follows in Item G.

E. The company will not count the following absences if properly reported and verified.

1. Military Leave
2. Industrial Injury
3. Union Business Leave
4. Funeral Leave
5. Suspension
6. Jury Duty
7. Vacations
8. Holidays
9. Subpoena, or verified appearance before State or Federal agencies.
10. Acts of God that cause a public catastrophe
11. One absence only shall be counted during each absence year, for those employees who must be off work due to the treatment of debilitating effects of major illness, such as coronary heart disease and cancer. Verification of the reason for each absence must be provided to the Personnel Dept.

F. Lates/Leave Earlies - Same disciplinary steps as for absences will apply. Lates/Leave Earlies are defined as any occurrence less than 60 minutes. Any combination of 13 occurrences will result in discharge,

G. Disciplinary Steps

First Step: (10th day absent, late/leave early)

1 written reprimand

Second Step: (11th day absent, late/leave early)

Reprimand and loss of world class status

Third Step: (12th day absent, late/leave early)

Reprimand and a 3 day suspension

Fourth Step: (13th day absent, late/leave early)

Discharge

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Penalties for Minor Offenses

The imposition of these or other appropriate disciplinary actions shall be subject to the Company's evaluation of all circumstances and events regarding the employee and the occurrence. Such disciplinary actions may include but are not limited to:

First offense - verbal or written warning

Second offense - written warning

Third offense - written warning and disciplinary suspension without pay

Fourth offense - discharge

MAJOR OFFENSES

1. Theft or unauthorized removal or attempted removal of Company property or property of others.

2. Refusal to carry out a reasonable direct order.

3. Threaten, provoke, fight, instigate a fight, attempt to do bodily injury or strike or manhandle another employee, supervisor, or company official at anytime.

4. Refusal to wear or utilize any safety procedure prescribed by the Company.

5. Horseplay of such a nature as to be capable of causing personal injury or property damage.

6. Drinking alcoholic beverages or being under the influence of alcoholic beverages while on the company premises.

7. Being in possession of or using or being under the influence of narcotics, marijuana or hallucinatory drugs.

8. Carrying or being in possession of a deadly weapon while on company premises.

9. Willful or negligent damage to tools, equipment or other Company property.

10. Intentional falsification or destruction of Company records or reports.

11. Punching or altering another employee's time card or intentionally misstating the employee's own time card or other records.

12. Intentionally misrepresenting or willfully withholding facts in applying for or continuing employment.

13. Negligence or carelessness which may result in injury or damage to oneself or others or Company property.

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FUTURA PLASTICS
& ENGINEERING, INC.

1920 Watterson Tra
Louisville, Ky. 4029
(502) 491-883

TIMECARD/TIMECLOCK POLICY AND PROCEDURES

Each employee is assigned a time card. The time card must be personally punched in at the start of work and punched out when leaving work. A new time card will be placed in the racks by the clock every Monday.

The time card is our official record of the hours you work. Federal and State recordkeeping requirements place an obligation on the Company to maintain accurate records and to enforce certain regulations. Our Payroll Department needs an accurate record of all hours you have worked in order to pay you properly.

The following rules must be observed:

1. Employees must punch only their own time cards. Failure to observe this rule will result in disciplinary action, including discharge.

2. Time cards must be kept in the racks at all times.

3. If the time on the clock is no earlier than 7 minutes before your shift starts, you may punch in to work.

4. When you take lunch break you will again punch your card. This punch will be in the first OUT position immediately next to the punch you made at the beginning of your shift. Lunch break is 20 minutes.

5. When your lunch break is over, punch IN immediately next to the OUT position on the same day. There will now be 3 punches on the card for this particular day.

6. At the end of your shift, you will punch out for the day. A total of 4 punches should be recorded on your time card; IN to work - OUT for lunch - IN from lunch - and OUT for the day. The last punch must occur no later than 7 minutes after your shift ends.

7. When you are late to work, you may not make up the time at lunch or by staying over time.

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Project Future
Competency Area 1.0: Language Skills

Competency Number 1.4:	Read Workplace Materials Critically
Lesson Number 1.4.2.:	Locate and Summarize Information Contained in Manuals
Lesson Number 1.4.2.2:	Locate and Summarize Information Contained in safety manuals
Lesson Objective:	Given a copy of a company Safety Manual, the trainee will be able to correctly complete eight of ten items concerning information contained in the manual.
Prerequisite Skills:	The trainee must be able to read. The trainee must understand plastics terminology. The trainee must have some prior knowledge of machine parts.
Literacy Skills:	The trainee will write a short paragraph. The trainee will demonstrate problem-solving skills. The trainee will use critical-reading skills to locate information quickly.

Presentation:

I. The trainer will ask trainees to write a short paragraph about a safety problem they have observed. When trainees have completed the paragraphs, ask trainees to share. Lead the trainees to solve the problems by having them make recommendations for solutions. Ask trainees to give possible ramifications of not knowing safety procedures. What would a trainee do if an issue arose for which he/she did not know the procedure? The trainee would need to be able to locate the information quickly.

II. The process for locating information quickly is the same for all manuals. Using the safety manual and the handout, Critical Reading for a Purpose, the trainer will discuss the strategies for finding information quickly. Trainer must instruct trainees to:

Look for:

- the titles and headlines
- items that are in bold type or underlined
- topic and summary sentences of paragraphs
- bulleted items
- italicized words

Evaluation: Trainees will complete the questions on the handout by writing summary sentences after locating the information in the Safety Manual. Employees will self-score their responses.

Extension Activity: Trainer will locate several home-remedy and medical-reference guides for home use. The trainer will prepare "3 X 5" cards with several common ailments listed on them. The trainees will use the reference guides to locate information asked for on the cards. Note: Because cuts and burns are common injuries for plastics employees, these should be included on the cards. The trainees share their findings.

Critical Reading for a Purpose--Safety Manuals

Use your copy of the company safety manual to find the answers to the following questions. Remember to apply the strategies for finding information quickly.

1. If you have to reach into the mold space for more than a few seconds, what should you do?
2. What heats the injection cylinder of the injection molding machine?
3. What should you do about electrical boxes without covers; open control panel doors; and broken, damaged electrical cords?
4. What are two causes of accidental falls in a plastics plant?
5. What machine throws small pieces of reground resin from its mouth?
6. What is the proper procedure for cleaning a grinder?
7. What is the function of the stop button?
8. What are pinch points?
9. What is the job of the safety gate?
10. What is the safest way to dress when working in a molding plant?

True or False.

_____ 11. You should use air hoses to blow pieces of plastic fuzz from your clothing before you leave your station.

_____ 12. Air hoses can cause small cuts or burns with serious, long-run consequences.

_____ 13. Never reach past closed guards while the machine is in operation.

_____ 14. You must wear safety glasses.

_____ 15. All injection molding machines must be equipped with electrical, hydraulic, and mechanical safety devices.

_____ 16. Spilled hot plastic cannot easily burn through thin shoes, and sharp, plastic parts; runners; or sprues cannot pierce soft, thin soles.

_____ 17. The motor or emergency stop button has been placed close at hand by government safety regulation.

_____ 18. It is perfectly safe to reach into the material hopper or the feed throat of the machine while it is running.

_____ 19. Small parts, pieces of scrap plastic, or spilled plastic pellets or granules can be slippery under foot and can cause falls.

_____ 20. When cleaning a grinder, don't just shut the switch off, pull out the power plug and hang it up where you can see it so that someone cannot come along and turn the machine back on while you have your hands and fingers in it.

Critical Reading for a Purpose--Safety Manuals

Use your copy of the company safety manual to find the answers to the following questions. Remember to apply the strategies for finding information quickly.

1. If you have to reach into the mold space for more than a few seconds, what should you do? *Stop the motor that drives the whole machine.*

2. What heats the injection cylinder of the injection molding machine? *High voltage electricity*

3. What should you do about electrical boxes without covers, open control panel doors; and broken, damaged electrical cords? *Report them.*

4. What are two causes of accidental falls in a plastics plant? *Tripping over poorly placed equipment and tools and slipping on plastic particles, small parts, or spills*

5. What machine throws small pieces of reground resin from its mouth? *A grinder*

6. What is the proper procedure for cleaning a grinder? *1. Turn it off. 2. Disconnect the power. 3. To prevent someone's re-plugging the machine, hang the power cord where you can see it. 4. Remove all the old plastic and blow with an air hose.*

7. What is the function of the stop button? *It stops the motor that drives the entire machine.*

8. What are pinch points? *Pinch points are created as moveable parts of a mold meet. They will pinch fingers and hands causing severe injury.*

9. What is the job of the safety gate? *The safety gate protects you from the massive force of the clam and from molten plastic that could be thrown from the mold.*

10. What is the safest way to dress when working in a molding plant? *Wear long, tight-fitting sleeves; long pants; no jewelry; heavy, thick-soled shoes; safety glasses; and ear plugs.*

True or False.

F 11. You should use air hoses to blow pieces of plastic fuzz from your clothing before you leave your station.

T 12. Air hoses can cause small cuts or burns with serious, long-run consequences.

T 13. Never reach past closed guards while the machine is in operation.

T 14. You must wear safety glasses.

T 15. All injection molding machines must be equipped with electrical, hydraulic, and mechanical safety devices.

F 16. Spilled hot plastic cannot easily burn through thin shoes and sharp plastic parts, runners, or sprues cannot pierce soft thin soles.

T 17. The motor or emergency stop button has been placed close at hand by government safety regulation.

F 18. It is perfectly safe to reach into the material hopper or the feed throat of the machine while it is running.

T 19. Small parts, pieces of scrap plastic or spilled plastic pellets or granules can be slippery under foot and can cause falls.

T 20. When cleaning a grinder, don't just shut the switch off; pull out the power plug and hang it up where you can see it so that someone cannot come along and turn the machine back on while you have your hands and fingers in it.

Project Future
Competency Area 1.0: Language Skills

Competency Number 1.4: Read Workplace Materials Critically

Lesson Number 1.4.2.: Locate and Summarize Information Contained in Manuals

Lesson Number 1.4.2.3: Locate and Summarize Information Contained in Production Training Manuals

Lesson Objective: Given a copy of a company production training manual, the trainee will be able to correctly complete eight of ten items concerning information contained in the manual.

Prerequisite Skills:
The trainee must have the ability to read.
The trainee must understand plastics terminology.
The trainee must have a general knowledge of machine parts.

Literacy Skills:
The trainee will use critical-reading skills to locate information quickly.
The trainee will demonstrate interpersonal-communication skills.
The trainee will apply write phrases to answer questions about training materials.

Presentation:

I. The trainer will divide the trainees into groups of three or four. Ask each group member to write down at least one question about the injection molding process. After all groups have had time to write their questions, the trainer will ask trainees to share. The trainer should write the questions on the board. Ask trainees to volunteer to look up one of these questions as they complete the exercise. After the exercise is completed, trainees report answers to questions they were assigned.

II. The process for locating information quickly is the same for all manuals. Using the production training manual and the handout, Critical Reading for a Purpose, the trainer will discuss the strategies for finding information quickly. Trainer must instruct trainees to:

Look for:
- the titles and headlines
- items that are in bold type or underlined
- topic and summary sentences of paragraphs
- bulleted items
- italicized words

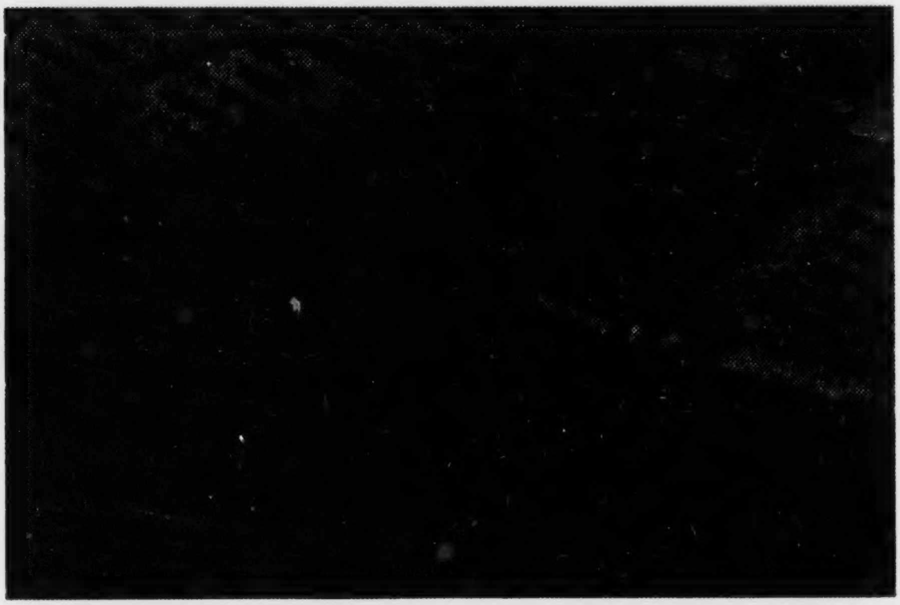
Evaluation: The trainees complete the exercise, Locating Information in the Production Training Manual.

Extension Activity: The trainer will prepare "3 x 5" cards with various problems, associated pieces of home equipment, such as washing machines, dishwashers, televisions, etc. The trainees will use the *Yellow Pages* telephone directory to locate repair services for these machines. The trainer may wish to limit the time allowed to find the information. If time permits and telephones are available, the trainees could obtain telephone estimates and compare service-call rates and hourly repair rates of three of their sources. Trainees may work alone or with partners.

Critical Reading for a Purpose

When reading for a purpose, there are techniques you can use to locate information quickly.

- Define the purpose.
- Look at the table of contents.
- Skim the titles and headlines.
- Look at items that are in bold type or underlined.
- Read the first and last sentences of paragraphs--they often give a summary of the paragraph.
- Look at bulleted items.
- Read italicized words.
- Use the index.



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CRITICAL READING:
READING FOR A PURPOSE

Reading for a purpose is a critical skill not only in the workplace but also in everyday life. There will be times when you need information quickly. There may not be anyone available to answer your question. You will need to be able to locate the information you need quickly.

One of the best ways to locate information quickly is to do critical reading. Look at:

- ☐ The titles and headlines.
- ☐ Items that are in bold type or underlined.
- ☐ Topic and summary sentences of paragraphs.
- ☐ Bulleted items.
- ☐ Italicized.

Answer the following questions by **quickly** finding the information in the *Employee Guidebook.*

Short Answer or Fill-in-the-Blank Questions

1. What should you do if you are going to be late for your shift?

2. What are you to do if you must be absent from work?

3. What is the starting time for the second shift? The quitting time?

4. Where can you find a layout of the plant that shows where each workstation is located?

5. What should you do if you forget to punch you time card when you go to lunch?

6. How many breaks are you entitled to during an eight-hour shift? How long are these breaks?

7. Where should you take your break?

8. How long is the lunch break?

9. If you work the second shift, when must you let your supervisor know that you will be absent?

10. Carrying a deadly weapon _____________ is a violation of work rules.

11. Probationary employees are allowed a total of _______________ occurrences of absence, being late, or leaving early.

True or False:

______ 1. Assume that you will be accepted for regular work at the end of you probationary period.

______ 2. You will not need to clock out at lunchtime.

______ 3. If you will be late or absent, tell whoever answers the telephone at Futura.

______ 4. You may not wear sandals or open-toed shoes to work.

______ 5. Wear loose, free-fitting clothes to work in.

______ 6. Employees may not bring drugs or alcohol drinks to work.

______ 7. When no work is available, employees may talk or listen to their radios.

______ 8. Employees maybe sent home after four hours when no work is available.

______ 9. Carelessness that may result in injury to yourself or others is considered a minor offense.

Locating Information in the Production Training Manual

Use the copy of the production manual provided to answer the following questions.

1. What are the two kinds of machines commonly used in the injection-molding industry today?

2. What is the difference in the two machines?

3. At the peak of a molding cycle in a plunger-type machine, the pressures in the mold and in the cylinder can reach how many pounds per square inch?

4. How many cylinders are there in a preplasticizer?

5. What are the names of the cylinders?

6. What is the most common type of mold?

7. In mold for articles that can be broken from the runners by hand, the runners are thinned out into what is called a ______________ where the material enters the cavity of the mold.

8. Name some common types of materials used in the manufacture of plastics.

9. What are the two groups of plastics?

10. Describe the basic injection molding cycle.

Locating Information
In the Production Training Manual

Use the copy of the Production Manual provided to answer the following questions.

1. What are the two kinds of machines commonly used in the injection molding industry today? *Plunger-type and screw-type machines*

2. What is the difference in the two machines? *The plunger-type uses a hydraulic piston or plunger to force the molding material along the cylinder and around a spreader. The material passing between the spreader and the cylinder is melted to the point where it can be forced through the injection nozzle into the mold.*

   The screw-type machine uses a rotating screw that moves back and forth within the heating cylinder, instead of the plunger and spreader. As the screw rotates, the molding material comes off the end of the screw; the screw moves back to permit the plastic material to pool. At the right time, the screw is pushed forward and propels the melted material out of the nozzle and into the mold

3. At the peak of a molding cycle in a plunger-type machine, the pressures in the mold and in the cylinder can reach how many pounds per square inch? *20,000 pounds per square inch or more*

4. How many cylinders are there in a preplasticizer? *Two*

5. What are the names of the cylinders? *The primary cylinder and the secondary cylinder*

6. What is the most common type of mold? *The two-plate mold*

7. In molds for articles that can be broken from the runners by hand, the runners are thinned out into what is called a ____*gate*_____ where the material enters the cavity of the mold.

8. Name some common types of materials used in the manufacture of plastics. *Polyvinly chloride (PVC), polystyrene nylon, polythhylene, and many others*

9. What are the two groups of plastics? *Thermosets and Thermoplastics*

Describe the plastic injection molding cycle. *A plastic material is heated until it is soft enough to be liquid-like. It is then injected or forced into a mold. Then after a short time, the plastic becomes solid again and the mold is opened and the part is ejected.*

Project Future
Competency Area 1.0: Language Skills

Competency Number 1.4: Read Workplace Materials Critically

Lesson Number 1.4.2: Locate and Summarize Information Contained in Manuals

Lesson Number 1.4.2.4: Locate and Summarize Information Contained in Troubleshooting Guides

Lesson Objective: Given a copy of a Troubleshooting Guide for Injection Molders, the trainee will be able to locate the solution to ten problems.

Prerequisite Skills:
The trainee must be able to read.
The trainee must understand plastics terminology.
The trainee must have general knowledge of quality control terminology.

Literacy Skills:
The trainee will read information and apply standards.
The trainee will demonstrate problem-solving skills.
The trainee will use critical-reading skills to locate information quickly.

Presentation:

I. Before class, the trainer will collect sample parts that illustrate a variety of quality-control problems from the production floor.

II. Using the handout, Critical Reading for a Purpose and the Trouble Shooting Guide for Injection Molders, the trainees will identify problems illustrated by the parts collected by the trainer. The trainer will inform the trainees that pictures are often critical to locating and using information in manuals and guides.

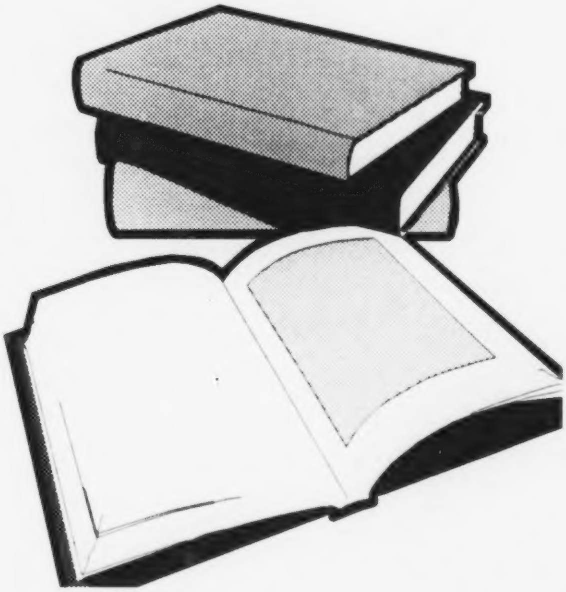
Evaluation: The trainees will use the Troubleshooting Guide to identify solutions to the problems listed in the exercise, Problem Solving with the Trouble Shooting Guide for Injection Molders.

Extension Activity: The trainer will purchase an inexpensive piece of unassembled furniture. The trainees will use the packaged instructions to assemble the furniture. The trainer will emphasize that most of the instructions are accompanied by pictures or diagrams.

Critical Reading for a Purpose

When reading for a purpose, there are techniques you can use to locate information quickly.

- Define the purpose.
- Look at the table of contents.
- Skim the titles and headlines.
- Look at items that are in bold type or underlined.
- Read the first and last sentences of paragraphs--they often give a summary of the paragraph.
- Look at bulleted items.
- Read italicized words.
- Use the index.



Problem Solving
with the Trouble shooting Guide
for Injection Molders

Use the Trouble shooting Guide to describe the following problems and to write one solution for the problem.

Problem	Solution
Voids or Bubbles	
Warpage	
Sink Marks	
Splay Marks	
Flow Lines	
Mold Flash	
Short Shots	
Black Streaks or Specks	

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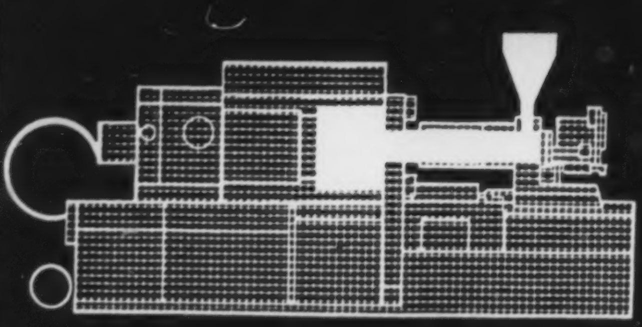
Trouble Shooting Guide For Injection Molders



Voids

Problem	*Solution*
Injection pressure too low	Increase injection pressure
Packing time too short	Increase packing time
Insufficient feed of material	Increase feed allotment
Mold temperature too low	Raise mold temperature
Injection speed too high	Decrease injection speed
Excessive cushion	Decrease cushion
At the side of a rib: rib too thick	Reduce rib thickness
Runners or gate too small or badly positioned	Increase and/or improve dimensions. Relocate near heavy sections

Warpage

Problem	*Solution*
Mold closed time too short	Increase mold closed time
Inefficient injection forward time	Adjust injection forward time
Ram speed too high or too low	Analyze parameters and adjust injection speed accordingly
Injection and holding pressure too high or low	Analyze conditions: raise or lower as required
Melt temperature inadequate	Adjust cylinder temperature to match requirements for specific resin
Excessive nozzle and metering zone temperatures	Decrease nozzle and metering zone temperatures
Mold temperature too high (for thick wall sections)	Lower mold temperature
Parts cool unevenly	Correct mold temperature variation Reduce variation in wall thickness Fixture parts during post-mold cooling
Parts underpacked	Increase feed
Improper gate location	Relocate gates to avoid thin sections, ribs, or curved sections
Gate too restrictive	Adjust gate dimensions to improve flow of resin
Unequal temperature between mold halves	Equalize temperature of both halves of mold
Non-uniform part ejection	Observe mold for part ejection uniformity
Parts mishandled after ejection	Check handling of parts after ejection from mold
Unbalanced gates on multiple gated part	Increase cylinder temperature
Too many stresses in part	Increase cylinder heat and decrease injection pressure

SECTION 2

Identifying Molding Defects

Some of the most common types of defects that appear in molded thermoplastic parts. The causes of these defects can be traced to the molding machine, the mold, or the material. However, the specific defect must be identified by the process engineer or trouble-shooter before a solution can be suggested and the molding parameters changed to relieve the problem.

This section of the Trouble-Shooting Guide for Injection Molders is intended to assist the molder in identifying specific defects in molded parts. The illustrations presented here show molding defects and describe their physical appearance. Note that the illustrations accentuate the defects to enhance identification. In actual practice, some defects can be seen only with the aid of a magnifying glass.

After the defect is found and identified, there is a tendency for the machine operator to overreact in making changes in the machine operating parameters. Use caution. Make only one change at a time and then permit the machine to stabilize after each change. A good rule of thumb is to wait for about 10 shots after a pressure or time change. When making adjustments in temperature, it is advisable to wait for 20 to 30 shots, then re-examine the parts.

It also is highly recommended that records be kept of all changes made and of the results of the changes in the molded part.

Sink Marks: *Depression in a molded part caused by shrinking or collapsing of resin during cooling.*

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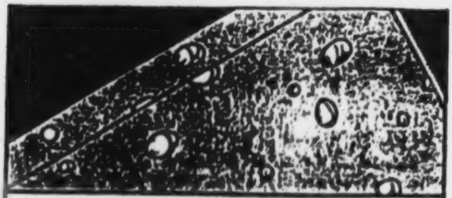
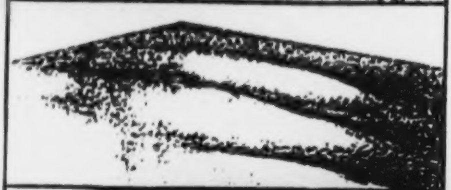
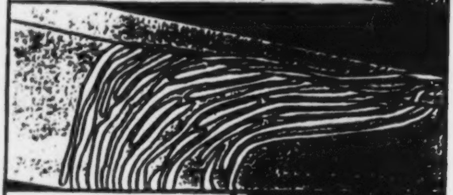
Voids (Bubbles): *An unfilled space of such size that it scatters radiant energy such as light*



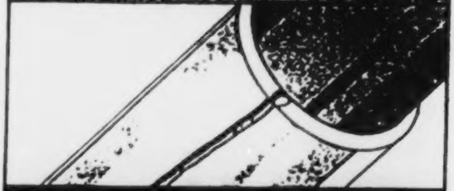
Delamination (Skinning): *Surface of the finished part separates or appears to be composed of layer of solidified resin. Strata or fish scale type appearance where the layers may be separated*



Flow Lines and Folds: *Marks visible on the finished item that indicate the direction of flow in the cavity*

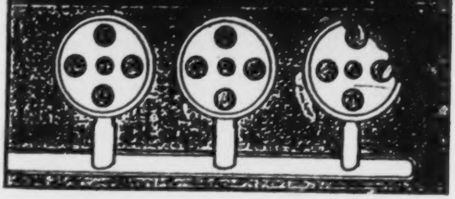


Cracking: *Fracture of the plastic material in an area around a boss, projection, or molded insert*



Low Gloss: *Surface roughness resulting from high speed fill which causes surface wrinkling as the polymer melt flows along the wall of the mold*

Short Shot: *Injection of insufficient material to fill the mold*



Problem	Solution
	parts. Use a short sprue with an extended nozzle
Gates, sprues, and/or runners too small	Enlarge gates, sprue diameters, and runners.
Excessive screw flights in metering zone	Use screw with shallower flights in the metering zone
Insufficient venting	Provide additional mold vents.
Improper gate location	Relocate gates.
Melt index of resin too low	If use requirements permit, select higher flow resin
Excessive clearance between non-return valve and barrel	Replace worn parts.
Screw bridging	Reduce rear zone temperature, increase forward zone temperature
Injection press of insufficient capacity	Increase feed allotment

Shrinkage

Problem	Solution
Injection pressure too low	Increase injection pressure
Hold time too short	Increase injection hold time
Cooling time too short	Increase length of cooling cycle
Stock temperature too high	Lower melt temperature
Mold temperature too high	Decrease mold temperature
Gates too small/not properly located	Analyze and increase sizes accordingly. Relocate if needed
Injection hold pressure too low	Raise injection hold pressure
Gate land length too long	Decrease length of land
Bad check valve	Replace
Insufficient cushion	Adjust feed to increase cushion

Sink Marks

Problem	Solution
Resin feed inadequate	Increase resin feed. Increase length of dwell of piston in full pressure position to pack out mold
Improper mold design	Enlarge runners and gates to prevent freeze off before part can be packed properly. Locate gates on or as near as possible to thick section
Parts cool too rapidly	Slow cooling and retard cooling capacity by holding the part in an oven or in a well insulated area
Rib section in part too wide	Decrease rib thickness to approximately 80% or less of adjoining wall

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Problem	***Solution***
Excessive injection speed	Decrease injection speed
Nozzle opening too small	Use larger opening in nozzle
Excessive gate land length	Decrease gate land length
Excessive injection pressure	Decrease injection pressure
Improper location of gate	Change location of gate
Purging compound left in cylinder	Run several shots to clear cylinder
Undersized sprue runner or gate	Increase dimensions of sprue runner and/or gate
Insufficient back pressure	Increase back pressure

Mold Flash

Problem	***Solution***
Mold parting surfaces do not seal properly	Check and rework mold surface to obtain a good seal at the parting line
Injection pressure too high	Decrease injection pressure
Clamp pressure set too low or projected area of item too large for clamp pressure of the machine	Adjust clamp pressure to maximum If use requirements permit select a higher flow resin to reduce injection pressure requirements Install mold in machine with higher clamping pressure If large gates are used consider restricting gating
Injection temperature too high	Lower injection temperature
Feed needs adjustment	Adjust feed
Hold time too long	Decrease injection hold time
Inadequate mold supports	Replace
Oversize vents	Decrease size of vents and if necessary, increase number of vents

Short Shots

Problem	***Solution***
Insufficient feed cushion	Adjust feed to minimum consistent cushion
Inadequate injection pressure	Increase injection pressure
Inadequate injection speed	Increase injection speed
Insufficient booster or injection high pressure time	Increase booster or high pressure time
Inefficient screw delay	Adjust screw delay
Inadequate injection back pressure	Increase back pressure
Melt temperature too low	Adjust screw speed to give higher melt temperature
Cylinder temperature inadequate	Raise cylinder temperature
Mold temperature too low	Increase mold temperature, particulary for very thin, large area

Section 3

Causes and Solutions Of Molding Defects

Black Streaks, Specks

Problem	**Solution**
Contamination of material	Examine material for contamination particularly if reground resin is being used. Check machine hopper
Holdup of molten resin in molding machine or mold runner system	Examine nozzle seat, cylinder walls and valves for "dead spots," surface roughness and charred material. Polish surface of cylinder and streamline to prevent hold up of material. Be sure that runner system is streamlined
Press contamination	Raise stock temperature to loosen degraded resin from cylinder walls and purge
Local over heating in the injection cylinder	Examine heater bands and controls for malfunctioning unit. Locate hot spot and remedy problem
Defective closure of the nozzle	Repair or replace nozzle as required
Oxidation by occluded air or inadequate air venting	Provide additional vents in mold
Mold contains grease	Remove and clean
Trapped air	Increase stock temperature
Inefficient injection speed	Decrease injection pressure, decrease booster time

Blisters

Problem	**Solution**
Screw rpm too high	Reduce screw rpm
Back pressure too low	Increase injection back pressure
Mold temperature too low	Raise mold temperature
Gate improperly located	Relocate gate
Insufficient venting	Provide additional mold vents
Regrind too coarse	Material needs additional regrinding

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Problem	***Solution***
Material insufficiently plasticated	Preheat feed Increase residence time in cylinder

Burns

Problem	***Solution***
Excessive injection speed	Decrease injection speed
Excessive injection pressure	Decrease injection pressure
Inefficient mold temperature	Adjust mold temperature
Excessive amount of volatiles due to improper venting	Check venting of the cavity If venting is inadequate, make provision for necessary venting Vent cavity at point of air entrapment Knockout pins can be relieved to help in venting
Improper gate location	Relocate gate
Front zone temperature too high	Decrease front zone temperature
Screw speed too high	Decrease screw speed
Excessive back pressure	Decrease back pressure
Compression ratio of screw too high	Decrease compression ratio
Faulty temperature controllers	Adjust, replace if necessary
Frictional burning gates too small	Increase gate dimensions
Dead material hung up on screw or nozzle	Purge
Melt stock temperature too high or too low	Analyze and raise or lower accordingly
Nozzle diameter too small	Increase nozzle diameter
Over heated heater band	Check heater band functioning Decrease heater band temperature
Incorrect screw rpm	Analyze screw rpm and adjust accordingly

Clear Spots

Problem	***Solution***
Unplasticated pellets	Improve plasticating capacity of machine by addition of specially designed nozzle Increase cylinder temperature increase cycle time Use injection molding machine with higher plasticating capacity Increase back pressure Change screw speed Use higher compression screw

Cloudy Appearance

Problem	*Solution*
Low stock temperature	Raise stock temperature
Low mold temperature	Increase mold temperature
Moisture	Redry resin
Contamination	Check for source of contamination and purge machine

Contamination

Problem	*Solution*
Other molding materials, foreign objects (metal, wood, paper, dirt, etc)	Check hopper, raw material containers, material handling systems and eliminate source of contamination Purge system

Cracks

Problem	*Solution*
Parts cool too quickly	Increase mold temperature Put parts in insulated container to cool
Molded-in stress	Reduce fill rate Increase mold temperature
Wall thickness too heavy for compound	Use compound with higher molecular weight base

Crazing

Problem	*Solution*
Insufficient drying of the material	Increase time or temperature of pre drying cycle
Contamination	Check supply material handling system and press, purge if required
Injection temperature too high (crazing accompanied by discoloring or yellowing)	Reduce stock temperature of melt
Mold surface contaminated	Clean mold surface in area of crazing
Inadequate injection speed	Increase injection speed
Inefficient injection forward time	Modify injection forward time
Excessive injection pressure	Decrease injection pressure
Mold temperature too low	Increase mold temperature Use a runner block
Gate too large	Decrease gate size

Deformation

Problem	*Solution*
Piece too hot on removal from the the mold	Increase cooling time and/or decrease mold temperature
Malfunctioning of the ejector sys	Repair or replace as required

BEST COPY AVAILABLE

Project Future
Competency Area 1.0 : Language Skills

Competency Number 1.4: Read Workplace Materials Critically

Lesson Number 1.4.3: Interpret Job Descriptions

Lesson Objective: Given copies of several job descriptions, the trainees will be able to correctly answer eight out of ten true/false questions about each description.

Prerequisite Skill: Ability to write letters.

Presentation:

I. Using the job descriptions, the trainer will read through each job description with the class. Trainees will write a short paragraph explaining how one job description relates to another description. The trainees will take turns sharing their thoughts.

II. Trainer will stimulate discussion by asking, "Do you feel that this job description adequately describes your job"? What changes, if any, need to be made to the job description to make it more closely match your perception of the job?

Evaluation: The trainees will complete a true/false questionnaire about the job description. If there are nonreaders, the trainer will read each item to the trainees and will allow time for trainees to record answers.

Extension Activity: The trainer will prepare "3 x 5" index cards with assignments for various products for the trainees to locate and purchase from one of several catalogues. The trainees will locate the item that most closely matches the description on the card; fill out the order form; and compute the total cost, including shipping and handling.

FUTURA PLASTICS
JOB DESCRIPTION

JOB TITLE: PACKAGING INSPECTOR (P.I.)

REPORTS TO: SHIFT SUPERVISOR

OBJECTIVE: Inspect boxes of product to be certain customer demands are met.

JOB REQUIREMENTS:
*MUST HAVE SHARP VISION
*MUST BE CAPABLE OF LIFTING BOXES OVER 25 LBS.
*WEEKEND WORK REQUIRED

1. Check boxes (be sure operator is using correct boxes – per packing instructions).

2. Visually check parts for defects. (P.I. is not to determine whether a part is good or bad; but to make sure operator is trimming properly and/or wiping grease, etc.). If the P.I. sees something, he/she is to bring it to the QC's attention.

3. The P.I. is responsible for labels (copying, filling them out, and taping boxes) Boxes must have a ✓ or an "O.K." placed on them by the QC before taping.

4. The P.I. is responsible for Box Count Sheets (making sure they are filled out properly), also making sure boxes have the correct amount in them (must use sample bag or box for reference at each machine).

5. The P.I. should help make boxes.

6. The P.I. should have no more than a maximum for four breaks, including their own.

7. The P.I. should be the Inspector's right-hand person. Do and help where and whenever needed.

8. The P.I. must supply cleaning materials, gloves, knives, blades, etc.

9. The P.I. reports to Production and collects and/or helps verify that the operator completes the pareto sheets.

FUTURA PLASTICS
JOB DESCRIPTION

JOB TITLE: PRESS OPERATOR

REPORTS TO: SHIFT SUPERVISOR

OBJECTIVE: Operate injection molding machines and all other manufacturing support equipment.

RESPONSIBILITIES:

1. Quality of parts. This includes visual checks, workmanship using knives, cutters, drills, mills. fixtures, gauges, and other support equipment.

2. Insure parts have fallen free before allowing press. to close.

3. Monitor mold surface for plastic build-up, loose matter, unusual sounds, water leaks and material drool. Jewelry should not be worn when working in mold area.

4. Operators must know how to shut off press in case of emergencyand understand press safety devices. Any defectivesafety device must be reported to the Area Foreman.

5. Operators call to inform supervision that they need help.

6. Operators are to notify their foreman if the mold fails to produce parts from all functional cavities.

7. Operators are required to follow all packaging and quality control requirements as stated at each press.

8. Operators are not allowed to grind or destroy any parts without approval from foreman.

9. Grind runners and scrap using proper procedures.

10. Operators must fill out and give to their foreman all records required each shift.

11. Operators must keep records on all reject Parts they Produce.

12. Operators are responsible for proper training of relief break operators and on-coming shift operators.

13. Operators should become involved with their jobs, being interested in methods and ideas to improve productivity.

14. Operators are responsible for good housekeeping. They should keep their work area neat and in order.

15. Operators are required to apply proper shipping labels to the cartons and sign them. If the foreman directs the operator to continue production of products which the operator does not agree meets the Specifications, then the operator is to obey the directions of the foreman, but should decline to sign the carton.

16. Operators are required to adhere to all company policies regarding conduct, safety practice and Job Performance.

17. Operators are to remain at their press until relieved and are to be at their work station promptly at the beginning and until the end of their shift.

18. Methods, Procedures, equipment layouts and directions of foremen are to be followed. Suggestions for changes are solicited; however, no changes are to be made without approval of the foreman.

19. Other duties may be requested by the Shift Supervisor.

FUTURA PLASTICS
JOB DESCRIPTION

JOB TITLE: FLOOR ATTENDANT

REPORTS TO: SHIFT SUPERVISOR

OBJECTIVE: Responsible for support in the areas of material handling, packaging, product movement, breaks, and quality.

RESPONSIBILITIES:

Material Handling

a) Properly blend raw materials at prescribed ratios (virgin/regrinds). Add proper color amounts when required.

b) Make sure sufficient materials and components are staged by the press so production is not interrupted.

c) Make sure material containers are labeled correctly

d) Read material handler daily log sheet and follow instructions.

e) Keep press and material areas clean and organized. Make sure the press operator helps.

f) Properly and safely care for all equipment that handles material on production floor including but not limited to: Dryers, Grinders. Loaders. Color Units. Mixers. and Hoppers.
Check and clean on a daily basis.

g) Keep assigned machines organized to help insure Gaylord's and barrels are kept covered to reduce spillage, spoilage, and contamination.

h) Clean filters on dryers and hopper loaders. Check belts and knives on grinders and prepare maintenance request forms when equipment needs repairs.

i) Grind defective product and work back into production on the shift it was generated or move to material staging area properly labeled and ground. Do not leave -for next shift unless approved by the oncoming shifts lead foreman.

Packaging

a) Insure that proper packaging is, being used per QC sheet on the press.

b) Tape the proper labels on the box per the QC Sheet.

c) Bring the proper packaging to the press prior to start up and return the unused packaging from the EOR job to the warehouse in a neat manner. The shift that EORs a job should clean up the work station. The shift that starts a job should set it up. The QC sheets for a new job should be obtained from the shift QC.

Product Movement

a) Pick-up product that is QC approved from production floor and move to proper areas in plant per daily product movement map.

b) Weigh and count cartons where necessary to insure correct amount of product is packaged. Apply correct labels and neatly tape cartons. Place on skids correctly.

c) Record counts on box count sheets for completed product or make sure operator is doing correctly.
Notify shift supervisor of any problems.

d) Help load and unload trucks as required.

e) Operate forklifts in a safe and educated manner.

For EOR jobs, move all product from the floor with proper EOR label applied to last box.

Breaks

a) Cover breaks as directed by the shift Supervisor.

b) Check quality of parts while qiving breaks making sure parts conform to customer demands.

c) Schedule breaks to maximize the days productivity accounting for other job requirements and for mold changes and start ups, etc.

Quality

a) It is everyone's job to make sure that our customers demands are satisfied. Read the QC sheets and look at the parts, packaging, labels, scrap rates, etc. and help whenever possible.

FUTURA PLASTICS
JOB DESCRIPTION

JOB TITLE: SHIFT SUPERVISOR

REPORTS TO: PRODUCTION MANAGER

OBJECTIVE: Run each shift making sure it produces qualityproducts in the most efficient manner possible.

RESPONSIBILITIES:

1. Operator training--specifically in the areas of quality and equipment orientation.
2. Make sure that quality plans are posted and reviewed with each operator at the beginning of a Job and at least once per shift.
3. Make sure the operator follows the inspection plan and that the quality levels are being met. Must be responsive to operator complaints and promptly resolve their quality issues.
4. Verify that press efficiencies are meeting maximum targets by directing set-up, press operators or others to resolve any problems. Must communicate to *Production* Manager all problems beyond his scope or ability to resolve on a timely basis.
5. Is responsible for proper use of all materials required during his shift. Is responsible for timely notification of impending material or other shortages that may impact his efficiencies or quality levels.
6. Is responsible for the performance of subordinates.
7. Is responsible for housekeeping in his area of responsibility.
8. Is responsible for reviewing all production schedules, and to assure that each set-up has all the required tools. gauges, etc. per the QC sheet.
9. Is responsible for accurate and complete documentation of production counts, spoilage, efficiencies, etc.. of his area.
10. Is responsible for floor people and their job duties.
11. Must direct set-up and maintenance people to assure that they fulfill their duties.
12. Has the authority to stop a press if quality is Jeopardized or maintenance required. Must request maintenance or tool repair using the maintenance request or tool repair request forms.

13. Must, in conjunction with the Plant Manager, promptly and impartially implement proper disciplinary action as required.

14. Is responsible for. assigning operators to their presses monitoring their performance and time away from the press.

15. Will assist the incoming shifts in starting and will do all appropriate communications to assure a trouble free start up of the next shift.

16. Make sure their shift has left the plant in a satisfactory condition for incoming shift.

17. Loss of cavitation must be reviewed with the Production Manager and a decision to continue with less than full cavitation is to be made with his assistance.

18. Is to be alert to proper material usage, drying, packaging, counts, problem jobs or personnel and review with the incoming foreman any potential or actual problems encountered.

19. A daily log is to be maintained for each area and kept current so that other personnel can be kept abreast of problems.

20. High levels of cooperation with all other departments and personnel are necessary.

21. Perform safety checks as per Set Up Sheets.

22. Be responsible for control of Daily Scrap Work Sheets.

23. If the foreman requires the operator to continue production of products which the operator or QC does not feel are at acceptable quality levels, then the foreman must sign the box in the operator's place.

24. Perform other duties requested by the Production, Manager.

25. Help develop employees to become better operators, floor people, etc. The smarter your people--the better your shift.

FUTURA PLASTICS
JOB DESCRIPTION

JOB TITLE: LINE QC'S

REPORTS TO: QC SUPERVISOR

OBJECTIVE: Assist shift supervisor in reaching goal of maximum productivity and customer satisfaction.

RESPONSIBILITIES:

1. Audit production to QC standards.
2. Review all product going into grinders assuring only defective parts are ground per procedures.
3. Complete NMR with foremen..
4. Advise foremen of operator problems - (not filling out charts, parts, etc.).
5. Fill in where necessary but don't compromise quality.
6. Help develop plans for rework with foremen.
7. Do first piece for foremen and advise him of problems.
8. Fill out necessary paperwork:
    a) Red Tags
    b) SPC Charts
    c) Roving Sheet

FUTURA PLASTICS
JOB DESCRIPTION

JOB TITLE: MOLDING TECHNICIAN

REPORTS TO: MOLDING/PRODUCTION MANAGER

OBJECTIVE: Start up and monitor molding machines to obtain maximum productivity in most efficient manner.

RESPONSIBILITIES:

1. Start up new jobs and develop process shots showing processing pattern that will maximize press efficiency and produce repeatable, acceptable product.

2. Monitor press cycles, press set-ups, mold temperatures, controllers, hopper dryers, etc. -- to insure that all are set up and functioning properly during each shift.

3 Fill out process sheets for new jobs to Futura and complete process sheets for new start-ups per procedures.

4. Notify maintenance of machine problems.

5. Notify tooling of mold problems.

6. Correct processing problems in an intelligent manner as noted by operator, floor person, QC, shift supervisor or other.

7. Makes sure that set-ups are correct.

8. Performs duties of shift supervisor as required.

FUTURA PLASTICS
JOB DESCRIPTION

JOB TITLE: Production Manager

REPORTS TO: General Manager

OBJECTIVE: Accountable for the efficient operation and use of people, equipment and materials on all shifts

RESPONSIBILITIES:

1. Training of all personnel reporting to him.
2. Maintaining acceptable quality levels on each product produced.
3. Operating cost plant-wide including spoilage, equipment, operator utilization and efficiency.
4. Working with Molding Manager and molding technicians to improve plant efficiency.
5. Housekeeping plant-wide - floor, machines, etc.
6. Maintain fair and impartial application of company disciplinary rules.
7. Evaluate the performance of each individual reporting to him on a semiannual basis.
8. Maintain a preventative maintenance program for grinders, machines, etc.

FUTURA PLASTICS
JOB DESCRIPTION

JOB TITLE: QC MANAGER

REPORTS TO: GENERAL MANAGER

OBJECTIVE: Develop -a program and monitor it's implementation that will allow for maximization of profits and customer satisfaction.

1. Design pareto and X R charts for problem solving. Review and suggest corrective action.

2. Write the quality manual and procedures to help control product quality.

3. File and maintain customer concerns, deviations, engineering changes, etc. ...

4. Keep a spread sheet and follow up on corrective action. Verify quality commique is kept up to date.

5. Do first article inspections of all new customers parts and or parts that have had mold work.

6. Direct the Material Review Board writing the technical information pertaining to deviation, rework type, sorting techniques, etc.

7. Contact sales to forward any deviations request once reviewed by the Material Review Board.

8. Develop and schedule training classes in regards to the quality manual and standard operating procedures manual.

9. Help develop the quality goals and objectives for each year.

10. Do all capability studies and error of measurement for new products.

11. Review all charts posted at the bulletin board for completeness.

12. Review all log books such as red tag, last shot to see that they are filled out correctly and are up to date.

13. Investigate internal non-conforming Material Reports.

14. Conduct necessary audits to insure proper implementations of quality systems providing feedback to upper management.

15. .Customer contact--need to develop.

16. .Write QC sheets, packaging instruction, etc. . . . Keep updated utilizing procedures in QC manual.

17. Gauge calibration.

Project Future
Competency Area 1.0: Language Skills

Competency Number 1.4: Read Workplace Materials Critically

Lesson Number 1.4.4.: Demonstrate Understanding of Training Materials

Lesson Objective: Given sample paragraphs from a training guide for injection-molding personnel, the trainee will be able to write sentences that identify the main idea of each paragraph.

Prerequisite Skills: The trainee must have the ability to read and follow simple directions.
The trainee must be able to write simple sentences.

Literacy Skills: The trainee will be able to read paragraphs and select the main idea of each paragraph.
The trainee will be able to write sentences using appropriate punctuation to explain the main idea of passages.

Presentation:

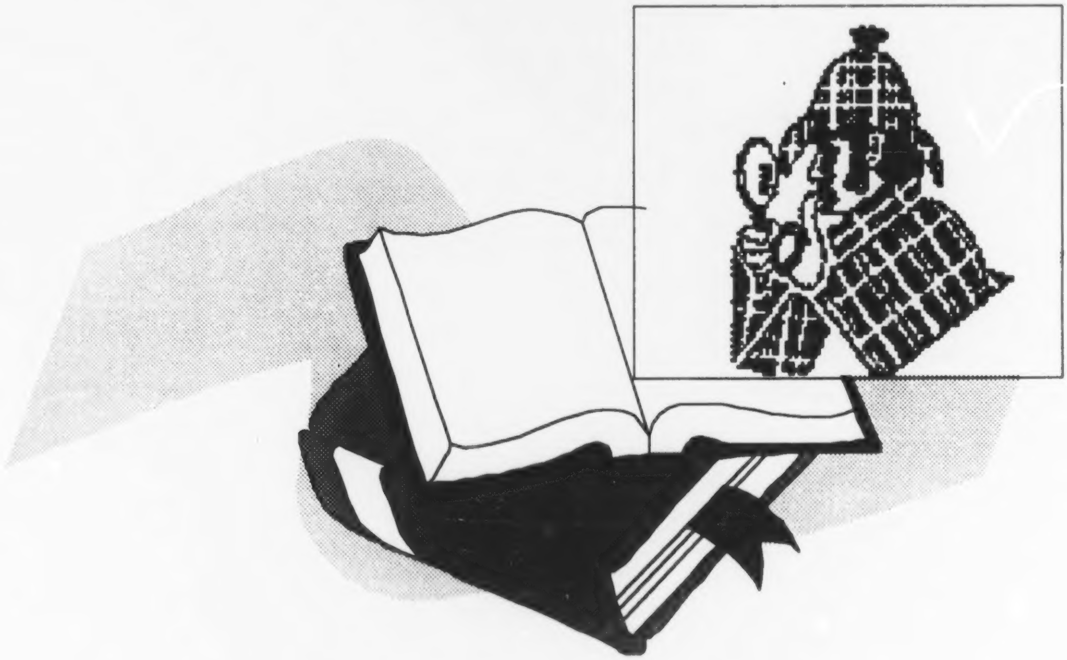
I. Using the handout, Getting the Main Idea, the trainee will explain that everything the trainee reads has a main point or idea. This main idea is the most important idea about the subject. It is the reason someone has written about the subject.

II. Trainees will practice by completing the practice exercise, What's The Point?

Evaluation: Trainees complete the exercise, Getting the Main Idea. The exercise contains sample paragraphs from a training manual for injection-molding personnel.

Extension Activity: The trainee will select and read a magazine article on time management, personal health management, or stress control and will write the main idea for each of the paragraphs in the article. The trainer will lead the trainee to see that articles are usually structured so that the main idea of the article is contained in the first and last paragraphs.

Getting the Main Idea



Over the years, you've spent a lot of time reading. In the past, reading meant reading for pleasure, or you may have memorized facts for a test of some kind. Now, reading has an entirely different meaning for you. Rather than "learning to read," most of your time is spent "reading to learn." Reading now means studying, taking notes, summarizing, reviewing, and so on.

From now on, most of the reading you do will be **reading to learn or study-reading.** Your goal will be to **read, remember, and use the main ideas** in order to write a report, take part in a discussion, or operate a piece of equipment. Luckily, there a number of strategies that can help you do this more efficiently.

Guidelines for Reading to Learn:

Pre-Reading--Before you read:

- Understand **why** you are reading.
- Gather all the materials you need to read and to take notes (notebook, handout, reference book, pen).
- Decide how much time you will need to do the reading and when and where you will do it. (Find a quiet, well-lighted spot.)
- Try to avoid doing your reading when you are overly hungry or tired; take short breaks to stretch and to rest your eyes.

As you read:

- Get to know your manual or text and what it contains: Use the index, glossary, and any special sections to help you locate information quickly.
- Use a specific approach to your study-reading-- SQ3R (Survey, Question, 3 R's--read, recite, review), mapping, or graphic organizers, or other techniques.
- Look over the whole chapter before you begin reading to get an overall picture of what the selection is about: if there are questions that go with the reading, look them over, too.
- Read the titles and headings and use them to ask yourself questions about what may be coming up next; notice words or phrases in italics or boldface type.
- Look closely at maps, charts, graphs, and other illustrations to help you understand and remember important information
- Take good notes on everything you read--summarize, outline, star, underline, or highlight important information.
- Use all of your senses when you read. Try to imagine what something looks, feels, and tastes like; draw illustrations.
- Adjust your reading speed to fit the assignment. Read difficult material slowly, reread if necessary.

After you read:

- Review your notes at the end of the reading session, again the next day, and as needed after that.
- Always summarize difficult material out loud (either to yourself or to someone else); make note cards or an outline to use later.
- Keep a list of things you want to check on, or ask someone about.

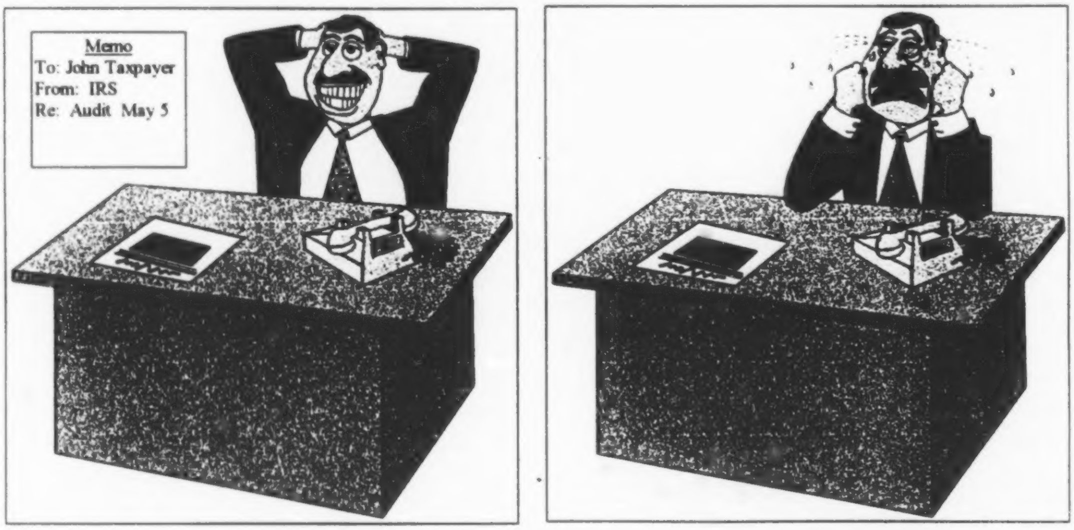
The Main Idea

Summarizing the main idea is a skill you perform daily without even thinking about it. For instance, if you gave someone the results of a football game, you wouldn't deliver a play-by-play account of what actually happened on the field. You would, instead, give a short version of the events that include only the main idea (who won?) and the important details (by what score? by whose efforts?)

When you are trying to decipher the main idea, you should ask yourself the following questions:

- Who or what object does the event involve?
- When did it take place?
- What event took place?
- Where did it take place?
- How did it happen?

For example, look at the following cartoon. Use the questions to figure out what is happening.



Who?

When?

What?

What?

Where?

How?

What's The Point?

Hint: One of the quickest ways to find the main idea is to look at the titles and headlines. You can usually predict what the main ideas is simply by looking at these.

Try out the methods we just discussed on the following short passages. After you have read the passages fill in the chart which follows each one.

In general, parts warp when one section shrinks faster or slower than another. Differential shrinking is usually a result of surfaces cooling at different rates.

***Mold design** is a leading cause of uneven cooling. Parts with thick and thin walls are prone to warping. Typically, the thick walled sections will not cool at the same rate as the thin walled sections.*

Who?	
What?	
Where?	
When?	
How?	

Try this part of the same topic.

***Mold temperature** also has a lot to do with uneven cooling. Usually a hot mold promotes better flow of melt into the cavity for proper filling. On some parts, however, the warmer mold will keep thick walled sections molten longer. When the mold opens, thick walled sections may continue to cool after the thin walled sections have already cooled and shrunk. The different cooling rates cause differences in shrinkage, which results in warping. Parts with differential wall thickness must have their cooling time adjusted for the thickest, slowest cooling, wall sections.*

Who?	
What?	
Where?	
When?	
How?	

When you closely examine a plastic part, you can see very fine details on the part. These details are very important to the customer. Injection molding is a precise system capable of reproducing these very fine details. The mold makes this reproduction possible. This also means that the mold will also faithfully reproduce all scratches, dents, rough spots or marks. The steel that the mold is made of is hard, but it is extremely easy to scratch or mark. Despite its big, strong appearance, the mold is delicate and is very, very easy to damage.

Main idea: ____

____

Damaged mold surfaces may cause parts to stick in the mold, producing defective pieces and slow cycle times. Flash, runners or parts caught in the closing mold will be pressed flat by the tremendous clamping force and will cause serious damage to the mold. This is sometimes referred to as "smashing a part." An accident like this can shut down a machine, can destroy a production schedule, and be very costly in mold repair.

Main idea: ____

____

NEVER USE STEEL TOOLS such as screwdrivers, cold chisels, pliers, shears, or a knife to dig plastic out of the mold. Use soft brass or plastic tools. Never scrub or scour the mold surface. Polishing is a job for a moldmaker. Some sections of the mold, such as pins and thin dividing walls, can be damaged by the plastic material. If your cavities do not fill, the material may be too cold and cause damage. And, if you delay too long between cycles, you will get a charge of over-heated material which will make a lot of flash. This can cause damage. When you notice these things, call your supervisor before serious damage results.

Main idea: ____

____

Getting the Main Idea

Check your ability to determine the main idea by reading the following passages and writing a short sentence explaining the main idea of each paragraph on the lines provided.

Types of plastics

All the plastics that are used in injection molding machines fall into two categories. They are either thermoplastics or thermosets. Thermosets may be called thermosetting plastics. Heat is the first phase with either of these plastics. The heat of the machine softens the plastic material so that it can be pushed into a mold. This is where the likeness between the two types of plastics ends.

Main idea: *The two categories of plastics are thermoplastics and thermosets.*

Thermoplastics are the plastics most commonly used for injection molding. Thermosets are usually molded by a different molding technique. In thermosets, the heat of the molding process "sets" the plastic into a hard, stiff state. Once they are set, thermosets cannot be re-heated and re-softened. Thermoset scrap cannot be reused.

Main idea: *Thermoplastics are the most commonly used plastics for injection molding because they can be remolded.*

A thermoplastic can be melted, hardened, and re-melted many times. Thermoplastics only need to be cooled in order to harden. So if the scrap thermoplastic is kept dry, is not damaged by too much heat, and is not contaminated by dirt or other plastic resins, thermoplastic scrap can be reused. This ground-up scrap is called regrind. Because regrind can be used in the same way that new (never before used) resin is used, it is just as valuable as the new material. Operators and materials handlers must learn to conserve regrind. **Scrap is valuable!**

Main idea: *Because it can be reused, regrind is valuable and must be handled carefully.*

Here are some tips that will help avoid the contamination of valuable regrind:

1) Clean all material handling equipment (scoops, buckets, drums, hoppers, conveyors, and molding machine feed throats) before use.
2) Be alert for contamination falling on materials out of the air (especially scrap saved for regrinding).
3) Avoid making dust when handling colorants or regrind.
4) Material spilled on the floor or on your machine should not be reused.

Main idea: *Take care to avoid contamination of materials.*

Molds

Most molds look like big, heavy, tough blocks of steel. In some ways they are. After all, it has to stand up to high temperatures and extreme pressures over thousands and thousands of operations.

Molds are more delicate and easily damaged than they look. One of the biggest continuing worries of the manager of an injection molding operation is mold damage. Even a very small, simple mold can cost as much as a new car. A large, complex, high-precision, multi-cavity mold is even more costly. When you consider that the parts being may only be worth a few cents, you can see why the mold has to stay in perfect condition for a very long time before all the money spent on it can be recaptured.

Main idea: *Because molds are very delicate and very expensive, they must be handled with extreme care.*

Main idea: ____

____

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Main idea: ____

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Main idea: ____

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Try this part of the same topic.

Uneven mold temperature *can make a big difference. A mold with hot spots or cold spots will make the part cool and shrink at different rates. A hot spot might keep one surface of the part molten hot longer than the others. If the mold opens before the hot surface has finished cooling, it will shrink without the cavity wall to shape it. The result is warping.*

Who?	
What?	
Where?	
When?	
How?	

Write a sentence which states the main idea of this entire passage.

____

____

____

What should the title of this passage be:

____

Main idea: *Because it can be reused, regrind is valuable and must be handled carefully.*

Here are some tips that will help avoid the contamination of valuable regrind:

1) Clean all material handling equipment (scoops, buckets, drums, hoppers, conveyors, and molding machine feed throats) before use.

2) Be alert for contamination falling on materials out of the air (especially scrap saved for regrinding).

3) Avoid making dust when handling colorants or regrind.

4) Material spilled on the floor or on your machine should not be reused.

Main idea: *Take care to avoid contamination of materials.*

Molds

Most molds look like big, heavy, tough blocks of steel. In some ways they are. After all, it has to stand up to high temperatures and extreme pressures over thousands and thousands of operations.

Molds are more delicate and easily damaged than they look. One of the biggest continuing worries of the manager of an injection molding operation is mold damage. Even a very small, simple mold can cost as much as a new car. A large, complex, high-precision, multi-cavity mold is even more costly. When you consider that the parts being may only be worth a few cents, you can see why the mold has to stay in perfect condition for a very long time before all the money spent on it can be recaptured.

Main idea: *Because molds are very delicate and very expensive, they must be handled with extreme care.*

When you closely examine a plastic part, you can see very fine details on the part. These details are very important to the customer. Injection molding is a precise system capable of reproducing these very fine details. The mold makes this reproduction possible. This also means that the mold will also faithfully reproduce all scratches, dents, rough spots or marks. The steel that the mold is made of is hard, but it is extremely easy to scratch or mark. Despite its big, strong appearance, the mold is delicate and is very, very easy to damage.

Main idea: *Because mold reproduce every detail including scratches, care must be taken not to damage the mold.*

Damaged mold surfaces may cause parts to stick in the mold, producing defective pieces and slow cycle times. Flash, runners or parts caught in the closing mold will be pressed flat by the tremendous clamping force and will cause serious damage to the mold. This is sometimes referred to as "smashing a part." An accident like this can shut down a machine, can destroy a production schedule, and be very costly in mold repair.

Main idea: *Damaged mold surfaces can shut down a machine, destroy a production schedule, and be very costly in mold repair.*

NEVER USE STEEL TOOLS such as screwdrivers, cold chisels, pliers, shears, or a knife to dig plastic out of the mold. Use soft brass or plastic tools. Never scrub or scour the mold surface. Polishing is a job for a moldmaker. Some sections of the mold, such as pins and thin dividing walls, can be damaged by the plastic material. If your cavities do not fill, the material may be too cold and cause damage. And, if you delay too long between cycles, you will get a charge of over-heated material which will make a lot of flash. This can cause damage. When you notice these things, call your supervisor before serious damage results.

Main idea: *Because the use of improper tools can cause serious damage to the mold, call a supervisor when you notice problems that involve the mold.*

Project Future
Competency Area 1.0: Language Skills

Competency Number 1.4: Read Workplace Materials Critically

Lesson Number 1.4.5.: Understand Sequence of Events in the Production of a Part

Lesson Objective: Given a series of steps involved in the production of a plastic part, the trainee will be able to number the steps in proper sequence.

Prerequisite Skills: The trainee must be able to read.
The trainee must have general knowledge of plastics production.

Literacy Skills: The trainee demonstrates understanding of sequencing.
The trainee will write simple sentences, using correct capitalization and punctuation.
The trainees will speak before a group.

Presentation:

I. The trainer will have trainees write a procedure detailing how to perform some process. This process need not be work-related, for example, baking a batch of cookies, mowing the lawn, changing the oil in a car, creating a craft, making a time-line of their lives, etc. Ask trainees to use proper capitalization and punctuation.

II. Allow trainees to share their procedures. Explain that the ordering of events is called time order or sequence. Sequence is used not only to tell someone how to do something; it is also used to record history. It is used in science to list the steps in an experiment or to show the stages of process, such as birth or cell division. In literature, a writer of novels may center the action around a plot. A plot is a sequence of events.

Certain words are used in sequencing. They are *first, second, third, next, before, later, last, earlier, final, then, after, since, finally, begin, a, b, c, now, while, until*

III. Trainees will complete the exercise, Practice Getting it All in Order. This exercise contains three practice passages for trainees to read and number events in order.

Evaluation: Trainees will complete the exercise, Injection Molding, Step by Step. This worksheet contains the major steps involved in the production of a plastic product. The trainees will number the steps in order.

Extension Activity: Using an American Red Cross Poster, the trainees will write a simplified procedure for performing CPR.

Practice Getting It All In Order

Underline the words that in the following passage indicate time order.

Weighing A Part

Select a random sample from the box of parts. Then take the sample to the QC station. Next, calibrate the triple beam scale by using a known sample weight on the side of the scale where the sample will be placed. After you know the scale is weighing accurately, place the sample parts on the scale. Then move the grams or centigram scale bar until the scale is balanced. Last, read the measurement and record it in the appropriate place on the form provided.

Underline the words that in the following passage indicate time order.

Folding a Business Letter

Do you know the correct way to fold a business letter? Folding the letter correctly will tell the person receiving the letter a lot about you. Are you careful or careless? Do you bother with details that may make a big difference on your job?

First, fold the bottom of the letter up one-third. Next, fold the top down, leaving about one-fourth of an inch of the paper showing bellow the edge. Finally, place the letter in an envelope with the open flap facing you, ready to be unfolded when your supervisor removes it.

Practice Getting It All In Order

Underline the words in the following passage which indicate time order.

Weighing A Part

Select a random sample from the box of parts. Then take the sample to the QC station. Next calibrate the triple beam scale by using a known sample weight on the side of the scale where the sample will be placed. After you know that the scale is weighing accurately, place the sample part on the scale. Then move the grams or centigram scale bar until the scale is balanced. Last read the measurement and record it in the appropriate place on the form provided.

Underline the words in the following passage which indicate time order.

Folding A Business Letter

Do you know the correct way fold a business letter? Folding the letter correctly will tell the person receiving the letter a lot about you. Are you careful or careless? Do you bother with details that may make a big difference on your job?

First fold the bottom of the letter up one-third. Next, fold the top down, leaving about one-fourth of an inch of the paper showing below the edge. Finally place the letter in an envelope with the open flap facing you, ready to be unfolded when your supervisor removes it.

The passage below explains how to form a box to place parts into. Number the steps in the correct order.

Preparing A Box to Receive Parts

_____ Eighth, run heavy shipping tape down the center of the seam where the two longer sides meet. The tape must run over each side at least three inches.

_____ Third, remove enough boxes to hold the production of your entire shift. This will eliminate wasting time by returning to the storage area.

_____ Fifth, notice the fold lines for the top and the bottom of the box.

_____ Seventh, fold the longer sides of the bottom to the center over the top of the two shorter sides.

_____ Fourth, push on the side edges of the flattened box. This will cause the box to open up to expose four sides.

_____ Second, go to the storage area and locate the size box you need.

_____ Ninth, repeat the seventh and eighth steps when sealing the top of the box.

_____ Sixth, fold the shortest sides of the bottom to the center.

_____ First, check the packaging instructions to see what the correct box size is.

Did you find this a particularly easy assignment? Why? Did you spot the time order (sequence) clue words helpful. The following words are signals that indicate a time-order pattern: *first, second, third, next; before, later, last, earlier, final, then, after, since, finally, begin, a, b, c..., now, while, until.*

Many manuals and "how to" books are written using sequencing or time order because processes are most easily explained one step at a time. Step-by-step instructions are easy to follow.

Injection Molding, Step – by - Step

As a final check of your skill in identifying the sequence of events, please number the steps below in the order they should happen during the production of a plastic part in a screw-type machine.

_____Second, the material is mixed in the warehouse.

_____Sixth, the material comes off the end of the screw, the screw moves back to permit the plastic material to accumulate.

_____First, the order is received in the office.

_____Fifth, as the screw rotates, the molding material is picked up by the screw blades and forced along the lot cylinder barrel.

_____Last, after enough time has passed for the plastic to cool, the mold ejects the completed part from the machine.

_____Seventh, the screw is forced forward, acting as a plunger and propelling the softened material out of the nozzle and into the mold through the Sprue.

_____Third, the material is loaded onto a folk lift or tractor and carried to the production floor.

_____Fourth, the material is fed into the hopper through the dryer with a vacuum-like hose.

Write a short procedure for the training department to use when teaching new employees how to perform an important part of your job. Remember to use sequence when writing the step - by - step instructions.

Project Future
Competency Area 1.0: Language Skills

Competency Number 1.4: Read Workplace Materials Critically

Lesson Number 1.4.6.: Use Comparison and Contrast to Determine Passable Parts

Lesson Objective: Given 12 parts (two each of six differing parts), the trainee will determine which parts are passable by comparing the parts to the trim samples of the parts.

Prerequisite Skills:
The trainee must be able to read.
The trainee must be able to write sentences.
The trainee must be familiar with quality control terms.

Literacy Skills:
The trainee will write paragraphs.
The trainee will compare and contrast two objects.

Presentation:

I. Prior to class, the trainer will collect 12 parts. These parts will be used by the trainees to practice identifying passable products in the evaluative exercise.

II. The trainer will explain that being able to compare and contrast two or more things is an important part of making decisions, for example, if you are considering changing jobs or purchasing a major appliance. Companies use comparison and contrast when making decisions about major investments in machinery or manpower. Is the added benefit worth the cost?

III. Trainer will give each trainee a copy of the local newspaper. If possible, the trainer will have one or two consumer-purchasing publications available for research. The trainees will select a major purchase to research. The trainees will narrow the selection to two brands of the same product. The trainees organize their data by making a grid chart of the major features of the product. When trainees have completed their research, they will write a three-paragraph essay comparing and contrasting their products. They may want to devote one paragraph to similarities and one to differences. The other paragraph can be a summary in which the trainees tell which product they have chosen to purchase and explain why they reached this decision.

Evaluation: Trainees will examine the parts collected by the trainer prior to class. Some of the parts are passable; others are rejects. Trainees will complete the checklist exercise by comparing and contrasting the parts against a standard--the trim sample.

Extension Activity: Trainees will compare the two health-care plans offered by the company to decide which benefits are most important and cost effective for them.

Comparison and Contract
Comparing Production Parts to the Trim Sample

		Standard (Trim Sample)				Reproduced Part
Yes	No			Yes	No	
	X	Shorts on bosses				Shorts on bosses
X		Small color specs				Small color specs
X		Part line flash trimmed				Part line flash trimmed
	X	Flash in center diameter hole				Flash in center diameter hole
X		4 holes around lip of part				4 holes around lip of part
	X	Flash in channel around lip of part				Flash in channel around lip of part
	X	Warpage				Warpage
		Other features				Other features

Note: Trainer must develop a comparison checklist that corresponds to the parts selected for review by trainees. List may be compiled from the Inspection Instruction Sheet

Project Future
Competency Area 1.0: Language Skills

Competency Number 1.4: Read Workplace Materials Critically

Lesson Number 1.4.6.: Understand Cause and Effect in Plastic Production

Lesson Objective: Given an exercise sheet of 26 items, the trainee will correctly determine whether there is a cause-and-effect relationship shown in 20 of the 26 items. The trainee will self score the sheet.

Prerequisite Skills:
The trainee must be able to read.
The trainee must have a general understanding of production principals.
The trainee must understand flow charts.

Literacy Skills:
The trainee will use cause-and-effect relationships to develop solutions to problems.
The trainee will develop a flow chart.

Presentation:

I. The trainer will explain that understanding cause and effect are critical in any kind of manufacturing operation. Entire systems are set up to track cause and effect. Statistical Process Control is one example. The quality-control inspectors take several measurements of random samplings of parts each hour and then chart the measurements. These measurements are the effect. The effect is then used to determine the exact cause. This is working backward to reach a solution.

As the trainees read along, read this example to the group.

If Smithers Foods is the only store in your neighborhood and all of the residents shop there, management will be less likely to offer special deals to attract shoppers. However, if Winston Foods opens and offers lower prices and better service, it is likely to draw shoppers from Smithers. As a result, Smithers Foods might have to offer special deals to attract shoppers.

The opening of the new store **(the cause)** leads to lower prices and better service from the older store **(the effect)**.

Every time you use the word *because* in explaining why something happens, you are showing a cause-and-effect relationship.

II. Use the handout, Cause-and-Effect Signals, to explain the words that usually define the cause-and-effect relationship. These words usually show a cause-and -effect relationship: because , since, as a result of, due to, therefore, consequently, follows, if . . .then, brought about.

When determining whether a piece of writing or a situation is a cause-and-effect relationship, ask yourself: What is the action that occurred? Why did it happen?

Even when the order of a sentence changes, the cause-and-effect relationship remains the same.

For example: *The employees went on strike because the break room had been locked.*

The what (the effect) is the employee strike. The why (the cause) is the break room is being locked.

If we change the order of the sentence, the meaning stays the same.

Because the break room had been locked, the employees went on strike.

The why and the what remain the same.

Evaluation: Trainees complete the exercise, Understanding Cause and Effect in Plastics Production.

Extension Activity: The trainees will use cause and effect to develop a contingency plan for overcoming everyday crises that may affect their ability to perform their job. Trainees will brainstorm potential problems and the effect these would cause. The trainees will then develop alternatives. For example, if the car breaks down, then I will ride bus number X to work.

Cause and Effect

If Smithers Foods is the only store in your neighborhood and all of the residents shop there, management will be less likely to offer special deals to attract shoppers. However, if Winston Foods opens and offers lower prices and better service, it is likely to draw shoppers from Smithers. As a result, Smithers Foods might have to offer special deals to attract shoppers.

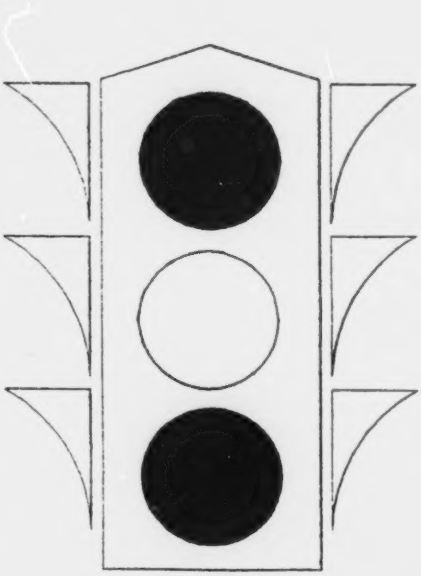
The opening of the new store **(the cause)** leads to lower prices and better service from the older store **(the effect)**.

Every time you use the word *because* in explaining why something happens, you are showing a cause-and-effect relationship.

Cause and Effect Signals

These words usually show a cause and effect relationship:

because
since
as a result of
due to
consequently
brought about
if…then
follows
therefore



Understanding Cause and Effect In Plastics Production

Write the word *yes* in the blank at the front of the sentences that show a cause and effect. Leave the blank empty if no cause and effect relationship is shown.

_____ 1. When the plastic is injected into the mold, every detail of the mold is faithfully reproduced because the cavity is filled under very high pressure.

_____ 2. The flow of plastic material through the heating cylinder of the injection unit is continually extracting heat from the metal parts.

_____ 3. This is like cooking in a hot pan.

_____ 4. If you take food out at the right time, then you will have a good meal.

_____ 5. If you leave it in the pan too long, then it will burn. Plastic production is the same.

_____ 6. Because you could hurt yourself or others, it is a good idea to keep the blade of your trimming knife covered or retracted into the handle.

_____ 7. If you reach past closed guards while the machine is in operation, then you may be injured.

_____ 8. You reached into the mold as it was closing; consequently, your fingers were pinched.

_____ 9. Even on fully automatic operation, be on the lookout for defects in the parts.

_____ 10. You left your safety glasses in your locker; therefore, the small fragments of reground plastic from the grinder injured your eyes.

_____ 11. Since melted plastic is unbelievably hot, don't forget the tremendous temperatures that are at work in your molding machine.

_____ 12. Never use air hoses to blow small pieces of plastic from your hands or clothes because they work under high pressure.

_____ 13. Your supervisor must be the one to make adjustments on the temperature or automatic cycle of your machine.

Understanding Cause And Effect In Plastics Production

Write the word yes in the blank at the front of the sentences that show a cause and effect. Leave the blank empty if no cause and effect relationship is not shown.

Yes 1. When the plastic is injected into the mold, every detail of the mold if faithfully reproduced because the cavity is filled under very high pressure.

No 2. The flow of plastic material through the heating cylinder of the injection unit is continually extracting heat from the metal parts.

No 3. This is like cooking in a hot pan.

Yes 4. If you take the food out at the right time, then you will have a good meal.

Yes 5. If you leave it in the pan too long, then it will burn. Plastic production is the same.

Yes 6. Because you could hurt yourself or others, it is a good idea to keep the blade of your trimming knife covered or retracted into the handle.

Yes 7. If you reach past closed guards while the machine is in operation , then you may be injured.

Yes 8. You reached into the mold as it was closing; consequently, your fingers were pinched .

No 9. Even on fully automatic operation, be on the lookout for defects in the parts .

Yes 10. You left your safety glasses in your locker. Therefore, the small fragments of reground plastic from the grinder injured your eyes.

Yes 11. Since Melted plastic is unbelievably hot, don't forget the tremovedous temperatures that are at work in your molding machine.

Yes 12. Never use air hoses to blow small pieces of plastic from your hands or clothes because they work under high pressure.

No 13. Your supervisor must be the one to make adjustments on the temperature or automatic cycle of your machine.

Yes 14. During the production of the part, the mold did not get filled completely. Consequently, when the part came out of the machine, a portion of it was missing. This is called a short shot .

No 15. In the injection-molding industry today, two kinds of machines are common: Plunger-type and Screw-type machines.

Yes 16. There was a delay in starting the next cyle of the machine. Therefore, the plastic material was overheated and damaged in the injection cylinder.

Underline the words that indicate a cause and effect relationship in the following paragraphs.

17.-20. Plastic pellets were spilled and left on the floor near molding machine number 21. As a result, two employees fell and were sent home. Sending the employees home resulted in our having to work twice as hard. Because I hate working so hard, I will be sure to sweep up any particles that I spill from now on.

21.-26. The parts from machine 22 came out with blisters on them. There are three possible reasons for the defect. If the screw rpm is too high, then the parts will have blisters. If the back pressure is too low, then the parts will have blisters. If the mold temperature is too low, then the part will have blisters.

Project Future
Competency Area 1.0: Language Skills

Competency Number 1.4: Read Workplace Materials Critically

Lesson Number 1.4.8.: Making Production Decisions by Drawing Conclusions

Lesson Number 1.4.8.1.: Predict Outcomes of Production Decisions

Lesson Objective: Given two scenarios in paragraph form, the trainee will complete an exercise of 10 sentences in which the trainee will accurately predict the outcome.

Prerequisite Skills: Trainees must be able to read.
Trainees must have some knowledge of plastics production.

Literacy Skills: Trainees will make predictions to determine a conclusion when reading.
Trainees will use brainstorming techniques to predict a conclusion.

Presentation:

I. The trainer will ask trainees to brainstorm ways they make predictions. As they speak, the trainer will write responses on the board. Some of these may be the weather, whether the roads are going to be slick, whether their favorite sports team will win, etc.

II. Predicting is a skill that helps improve critical thinking and reading. Using the handout, Making Predictions, read through the sample paragraph and model the steps listed at the top of the sheet.

Evaluation: Trainees complete the exercise, Predicting Outcomes. Trainee will self score

Extension Activity: Trainees will use the sports section from the newspaper to predict the winner of a sports event. The NCAA tournament brackets are ideal for this activity, which can extend the project for several days.

Making Predictions

When you predict an outcome, you guess what will happen next based on the pattern of events that happened before.

For example:

You are out on a long walk on a bright spring day. The air suddenly turns cooler; the clouds blow in; and the sky becomes dark. You will run for cover. You have *predicted* that it is going to rain. If you should look up as you are running and see a lightning bolt, you will *predict* that a clap of thunder will soon follow. You apply these same reasoning skills when you are reading or when you are looking for solutions to production problems.

The following strategy can help you to predict an outcome:

- List the events or actions in order.
- Think about how the events and actions might be connected.
- Relate these events and actions to past experience.
- Make a reasonable guess as to what will happen based on the evidence and your own experience.

Practice:

Read the following paragraph. Use the strategy above to predict an outcome.

The company policy states that any employee who misses more that three days in a six-month period will automatically be terminated. John Smithers works on the first shift, which runs 7 a.m. to 4 p.m. For various reasons, John has already missed three days work during this six-month period of his employment.

John celebrated his fortieth birthday last night in a big way, returning home at 1 a.m. Of course, he had to take a shower and relax a bit before he went to bed. When the alarm clock rang at 5:30 a.m., he reached over and shut it off. "I'll just sleep five more minutes," he thought. Three hours later, John woke up.

Based on the facts in this scenario, what do you predict will happen?

Predicting Outcomes

Read the following paragraphs. Answer the five items that follow each of the three scenarios.

The Supervisor's Folly

Background: The company requires all employees to attend a mandatory upgrade training program once a year. During the training session, the trainer emphasized mold care as a way of maximizing production and profits.

The most emphasized point in the training was that the biggest continuing problem at the company is mold damage. Mold damage is costing the company thousands of dollars each year. Molds look very sturdy. However, the mold is designed to precisely reproduce very fine details. This means that it will also faithfully reproduce all scratches, dents, rough spots, or marks. Steel tools are never to be used especially screwdrivers, cold chisels, pliers, shears, or a knife to dig plastic out of the mold. The company had set a new policy, and employees caught using improper tools or damaging molds would be reprimanded.

The next week, machine number 18 was set to run part number FSH-456465. The process had been running extremely well. The molded parts were nearly perfect. There were almost zero rejects. The cycle time was just under the target. You were making money for the company.

Then you heard a clang. The part that should have dropped a few moments ago did not drop. You looked inside the machine and noticed that the part was caught up in the mold and that the mold was opening and closing on the part. You hit the stop button and rang the call bell for the supervisor.

The supervisor told you that the lodged part had to be removed from the mold. He took out a one-inch wide screwdriver and hooked it gently into the mold to pry out the smashed part. The part did not budge. He pushed the screwdriver deeper into the mold and applied more pressure. The part finally dropped.

The machine was re-calibrated and the production got back on target. However, you noticed that every part then had two thin grooves that were about three inches long and an inch apart.

Why did the trainer emphasize mold care? ______________________________

____

Why did you ring the call bell? ___________________________________

____

Did the supervisor attend the training session?__________________________

Based on what you learned about molds at the training session, what caused the groves?

Based on company policy, what will happen next? ______

Grinding Horror Story

Background: The profit your company makes on the parts you mold is smaller than you think. When your machine is running steadily and producing consistently high-quality parts, it is profitable. But, if it is running slowly or shuts down often, it quickly becomes very costly to your company. One of the biggest problems that can cause a slowdown or shutdown is improper materials handling. No amount of skill can make up for contaminated or wet materials. Materials may be contaminated by dirt, foreign objects (lost jewelry, loose screws, etc.), or another plastic that is incompatible. Many plastics do not mix. The way they mix is similar to the effect you get when you attempt to mix oil and water.

When you arrived for your shift, you were assigned machine 2. You met with the operator from the previous shift to discuss any potential problems. According to policy, the operator took the last of her rejects and runners to the grinder before leaving. You watched as she did this. To your horror, you noticed that she took the rejects to the grinder that was labeled for machine number 4, which was located near machine number 2.

Because of your great training, you remembered that not all plastics mix well. Perhaps the grinder had been reassigned without being re-labeled? You asked the operator. "No, I have been using this all day. Besides, what difference does it make? Aren't they both the same color?" Then you noticed that the previous shift operator from machine 4 brought her rejects to the same grinder. You knew that the materials were incompatible.

Why is materials handling so important? ______

Why do the operators from the two adjacent shifts meet? ______

What should you do? ______

How could this problem have been avoided? ______

If no one reported the problem, what happened next?

Project Future
Competency Area 1.0: Language Skills

Competency Number 1.4: Read Workplace Materials Critically

Lesson Number 1.4.8.: Drawing Conclusions and Making Production Decisions

Lesson Number 1.4.8.2: Differentiate Fact, Opinion, and Hypothesis When Making Production Decisions

Lesson Objective: Given two written passages, the trainees will be able to correctly determine whether five statements about each passage are fact, opinion, or hypothesis.

Prerequisite Skill: Trainee must be able to read.
Trainees must have some knowledge of plastics production.

Literacy Skills: Trainees will differentiate between fact, opinion, and hypothesis.

Presentation:

I. The trainer will explain that evaluating information is critical to making good decisions in the workplace. The results of poor decisions can be costly. It is important to examine both written and spoken material to determine whether the information is fact, opinion, or hypothesis.

II. The trainer will use the handout, Fact, Opinion, or Hypothesis, What's The Difference? to explain that:

Facts are statements that can be proved with data--numbers or information.
Opinions are beliefs that are influenced by one's feelings, background, values, and outlook about life.
Hypotheses can be proved or disproved with the passage of time and additional information.

Evaluation: Trainees will complete the exercise, Fact, Opinion, and Hypothesis.
Trainee will self score.

Extension Activity: The trainee will read a newspaper article and will write a paragraph explaining whether the article contains any opinions of the writer.

Fact, Opinion or Hypothesis, What's the Difference?

- **Facts are statements that can be proved with data – numbers or information**
- **Opinions are beliefs that are influenced by one's feelings, background, values, and outlooks about life.**
- **Hypotheses can be proved or disproved with the passage of time and additional information.**

It is a fact, in the year 2001, most plastic products will be produced in Mexico. Hypothesis. The passage of time will tell. After the year 2001, you could so research to prove or disprove the theory.

It is a fact that plastic workers are better workers than steel workers. Opinion. It is based on a person's feelings. What makes one worker better than another is a matter of opinion.

It is a fact that there are 16 ounces in one pound. Fact. It can be proven by data you can look up.

Got it!

Project Future
Competency Area 1.0: Language Skills

Competency Number 1.4: Read Workplace Materials Critically

Lesson Number 1.4.8: Drawing Conclusions and Making Production Decisions

Lesson Number 1.4.8.3: Checking the Production Decision Process

Lesson Objective: The trainee will work with a group to identify a problem and to follow a problem-solving model to make a decision on a course of action.

Prerequisite Skill: The trainee must be able to read.

Literacy Skills: The trainee will demonstrate problems solving by drawing conclusions and predicting outcomes.
The trainees will demonstrate ability to work in a group.
The trainees will demonstrate interpersonal communication skills.

Presentation:

I. The trainer will explain that solving production problems often requires that a process be followed. The trainer will explain that having a plan to follow when making decisions is a good way to break the task into steps and to keep the problem-solver on task. Working with a group is often required when making decisions and solving problems at work. The trainees will be practicing both skills in this lesson.

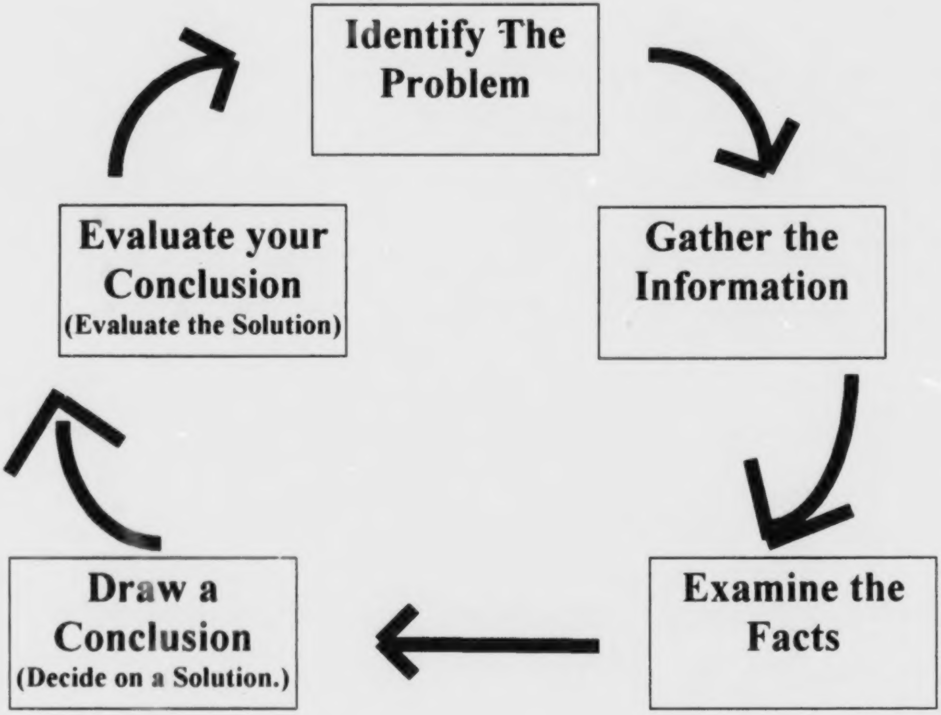
II. Using the handout, Drawing Conclusions at Work, the trainer will explain that making good decisions is a process of identifying the problem, gathering information, analyzing the facts, drawing conclusions, and evaluating the success of the solution. This handout will give trainees a guide to follow when drawing conclusions to make a decision. This is a basic problem-solving model and will work for most problems including mathematics.

Evaluation: The trainer will divide the class into groups of four or five. The trainees will use the steps in the handout, Drawing Conclusions at Work, to identify a problem and formulate a plan to deal with the problem. Trainees will share findings with the group.

Extension Activity: The trainee will identify a personal problem and use the problem-solving model to prepare a solution.

Drawing Conclusions at Work

Here is a strategy to help you get to the root of a problem and solve it. You can adapt the strategy to fit your needs in any problem-solving situation.


Identify The Problem
Gather the Information
Examine the Facts
Draw a Conclusion
(Decide on a Solution.)
Evaluate your Conclusion
(Evaluate the Solution)

Project Future
Competency Area 1.0: Language Skills

Competency Number 1.5: Complete Forms, Reports, and Letters

Lesson Number 1.5.1: Write Legible Product Labels

Lesson Objective: Given three product labels, the trainee will be able to write legible labels. Trainees will score each other's labels.

Prerequisite Skills: The trainee will have the ability to read simple directions.
The trainee will understand common plastics vocabulary.

Literacy Skills: The trainee will be able to print legibly.
The trainee will be able to categorize and interpret information from an instruction sheet.

Presentation:

I. Prior to class, the trainer will collect six samples of illegible product labels. The trainer will introduce the lesson by distributing the labels and asking for interpretation.

II. The trainer will explain that incorrectly written product labels cause costly mistakes. Products may be shipped to the wrong place. The incorrectly labeled product must then be returned at company cost. This may also cost the company the account because the company that needed the shipment has to wait for the correct product. This may cost the customer company money, thus, making them unhappy with the supplying company.

Evaluation: Trainees will complete the exercise, Preparing Box Labels Correctly.
Trainees will exchange labels and interpret each other's labels.

Extension Activity: The trainee will read the labels on several food products and will use the food pyramid to categorize the foods and prepare a healthy menu for one day. The trainee will write a paragraph explaining the importance of maintaining good health.

Preparing Box Labels Correctly

When the company receives an order from a customer, it is likely to be just one of several orders for the same customer. It is extremely important for the customer to receive the exact product ordered at the right time. The customer's ability to complete their orders on time depends upon getting the part they need in time to complete the job they have promised to their customer. If the customer is late getting their customer's order completed, they may lose the account. When that happens, the supplying company loses the customer's account. Lost accounts can mean lost jobs.

When the incorrect parts are delivered to a company, the receiving company usually returns the shipment to the supplier and charges the supplier for the return shipment costs. There may also be provisions in the customer's contract for penalty charges that the supplier must pay to compensate the customer for lost production time and the labor associated with re-packing and return shipping the product.

Correctly completed box labels are vital to assuring that the correct parts are shipped to the correct customer. This label is placed on every box of parts before it is sealed and removed from the machine. In some companies, this label is completed by the Package Inspector or Quality Control personnel. In other companies, the label is completed by the molding press operator. In either case, each label must be checked for accuracy and must becorrected using information taken from the Box Count Sheet. Since the operator is the one person to see every label, it would be wise for the operator to check each label and to notify a supervisor when errors are found.

Look at the following example. Study the label until you understand how each block is to be completed.

<table>
<tr><td colspan="12">PART NO:</td><td colspan="7">BOX NO</td></tr>
<tr><td colspan="10" rowspan="2">QUANTITY</td><td colspan="9">DESCRIPTION:</td></tr>
<tr><td colspan="9">COLOR: PART CODE:</td></tr>
<tr><td colspan="12" rowspan="2"></td><td colspan="7">SUPPLIER:
FUTURA PLASTICS</td></tr>
<tr><td colspan="7">INSPECTOR:</td></tr>
<tr><td>J
A
N</td><td>F
E
B</td><td>M
A
R</td><td>A
P
R</td><td>M
A
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G</td><td>S
E
P</td><td>O
C
T</td><td>N
O
V</td><td>D
E
C</td><td colspan="7">COMPANY NAME:</td></tr>
<tr><td>SHIFT:</td><td>1</td><td>2</td><td>3</td><td>DATE:</td><td>1</td><td>2</td><td>3</td><td></td><td>1</td><td>2</td><td>3</td><td>4</td><td>5</td><td>6</td><td>7</td><td>8</td><td>9</td><td>0</td></tr>
</table>

Project Future
Competency Area 1.0 : Language Skills

Competency Number 1.5: Complete Forms, Reports, and Letters

Lesson Number 1.5.2.: Complete Box Count Sheets

Lesson Objective: Given a box count sheet and a sheet with necessary information, the trainee will be able to accurately complete a Box Count Sheet.

Prerequisite Skill: The trainee must be able to read simple words.

Literacy Skills: The trainee will print legibly.
The trainee will categorize information and place it in the appropriate place on a form.
The trainee will practice oral communication skills.

Presentation:

I. The trainer will ask each student to think about how much money he/she has in his/her wallet or bank account. The trainer will ask trainees why and how they know this information. The trainees will volunteer various explanations.

II. The trainer will explain that Box Count Sheets are critical to the maintenance-accurate inventory of parts and to be sure that the proper quantity of parts are shipped to the customer.

Evaluation: Trainees will complete the exercise, completing Box Count Sheets. The trainer will compare the completed exercise to a correctly completed Box Count Sheet.

Extension Activity: Using the daily paper, the trainee will list the various headings and subheading in the paper and categorize the following (or similar) story titles under the appropriate heading:

- Flood Hits City
- Boy, 13, Swept Under Current Dies
- Kentucky Seeks Lessons In Going After Insurance Jobs
- Breaker, Breaker, CB Radios Still In Style
- Fashion Accessories Making About-Face
- Clinton Runs For Second Term
- Wanted: Areas Largest Manufacturer Seeks Employees for Second Shift . . .

The trainer will emphasize the importance of neatness and accuracy.

PART NO:
This number identifies the part by number.

BOX NO:
This is the number of the box for the order

QUANTITY:
This is the number of parts in the box.
Example:

DESCRIPTION:
This is a worded description of the part.
Front Window

COLOR:
The color of the part--RED

PART CODE:
The code for the part--form Box Count Sheet

SUPPLIER:

FUTURA PLASTICS

INSPECTOR:
Quality Control Inspector signs here.

Circle the name of the month.

JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	COMPANY NAME: *Customer's Name*

SHIFT:	1	2	3	DATE:	1	[✓ 2]	3		[✓ 1]	2	3	4	5	6	7	8	9	0

Circle the shift number

Circle the date. Use the first 1,2,3, as the first digit of the dates beginning with 10 through 30. Circle the other digit of the date using the 1 through 0. For example, the date of the 21 is circled.

Practice

Using the Box Count Sheet provided, complete the label below.

PART NO:	BOX NO
QUANTITY	DESCRIPTION:
	COLOR: PART CODE:
	SUPPLIER: **FUTURA PLASTICS**
	INSPECTOR:

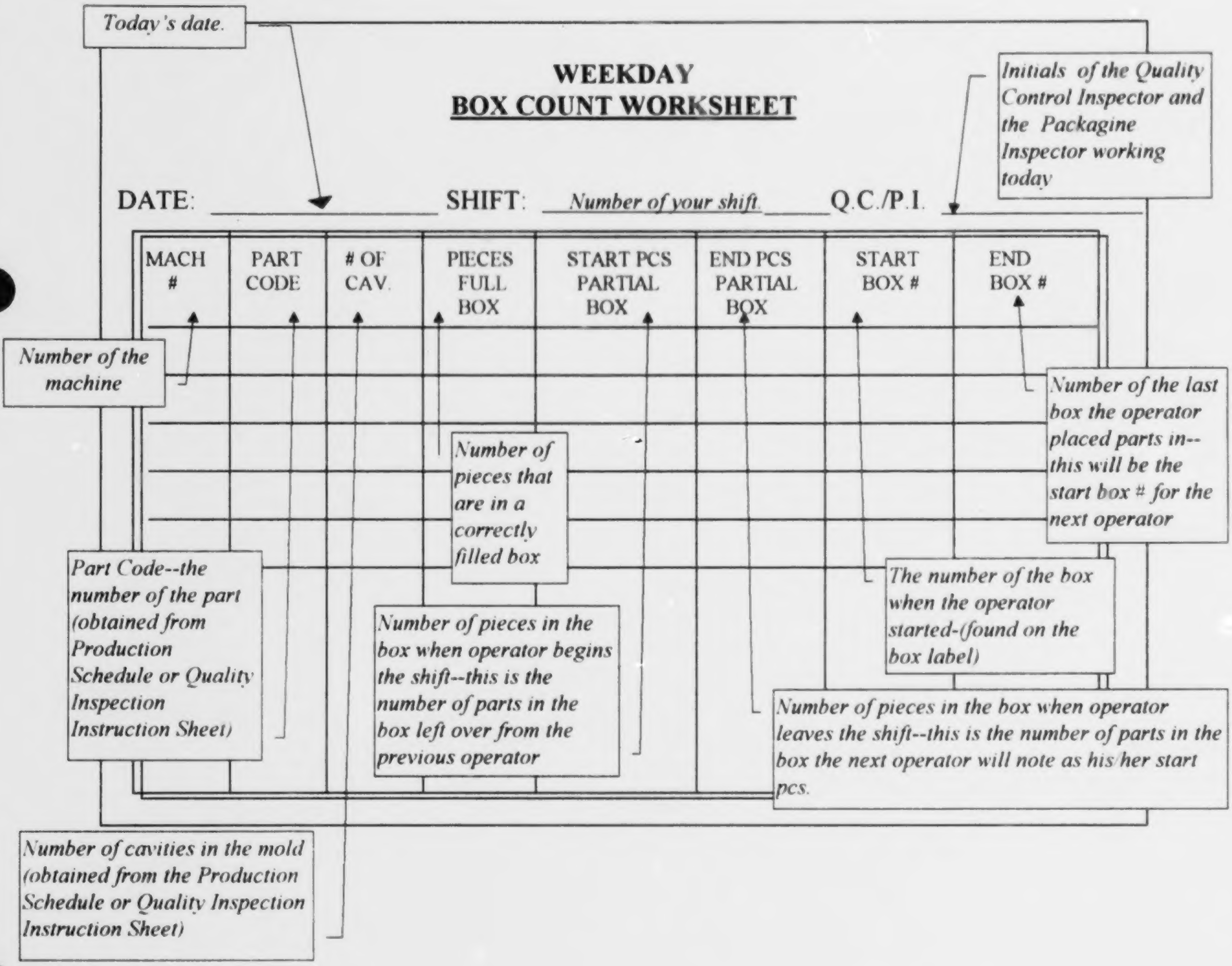
JAN	FEB	MAR	APR	MAR	JUN	JUL	AUG	SEP	OCT	NOV	DEC	COMPANY NAME:

SHIFT:	1	2	3	DATE:	1	2	3		1	2	3	4	5	6	7	8	9	0

Completing Box Count Sheets

The Quality Control inspector or the packaging inspector is usually in charge of being sure that the Box Count Sheet is correctly maintained. At the beginning of the shift the Quality Control inspector and/or the packaging inspector will check each machine to collect data for the sheet. Operators must be sure to note the figures as well. The Box Count Sheet ensures that correct numbers of parts are being shipped. When Box Count Sheets are inaccurate, too many or too few parts may be included in a box, or an incorrect number of boxes may be shipped. In any of these scenarios, the company loses money.

A sample piece of a Weekday Box Count Worksheet is included below. Study the sheet to be sure that you understand how to complete it.



WEEKDAY
BOX COUNT WORKSHEET

DATE: ____________ SHIFT: *Number of your shift* ____ Q.C./P.I. ____________

MACH #	PART CODE	# OF CAV.	PIECES FULL BOX	START PCS PARTIAL BOX	END PCS PARTIAL BOX	START BOX #	END BOX #

Today's date.

Initials of the Quality Control Inspector and the Packagine Inspector working today

Number of the machine

Number of the last box the operator placed parts in--this will be the start box # for the next operator

Number of pieces that are in a correctly filled box

Part Code--the number of the part (obtained from Production Schedule or Quality Inspection Instruction Sheet)

The number of the box when the operator started-(found on the box label)

Number of pieces in the box when operator begins the shift--this is the number of parts in the box left over from the previous operator

Number of pieces in the box when operator leaves the shift--this is the number of parts in the box the next operator will note as his/her start pcs.

Number of cavities in the mold (obtained from the Production Schedule or Quality Inspection Instruction Sheet)

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EXERCISE

Pretend that you are a packaging inspector. Use the information given to fill in as much information as possible on the Box Count Worksheet. Remember that neatness and accuracy are critical.

On machine number 21, a three-part mold is producing JON22. The parts are to be packed 65 pieces in each box. The operator notes that there were 23 parts in box number 265 when he came on the shift. He produced 28 boxes on his shift. He had 16 parts in the last box.

On machine 24, a two-part mold is producing RAZ63. The parts are packed 150 to a box. The operator started her shift with box number 933, which contained 22 parts. The parts are to be packaged 24 parts per box. She ended her shift with a box containing 18 parts. Her end box number was 1012. (How many boxes did she fill?)

John is running machine 12. He is to package the parts 112 per box. The machine is running part number REX638. The mold is 1149 and is a four-cavity mold. John's start pieces were 92 in box number 63. He ended his shift with box number 97 which had 68 pieces in it.

Judy is running machine 22. She is to package the parts 32 per box. The machine is running part number KJW638. The mold is 5678 and is a two-cavity mold. Judy's start pieces were 12 in box number 103. She ended her shift with box number 160, which had 18 pieces in it.

Janetta is running machine 10. She is to package the parts 44 per box. The machine is running part number PLE10. The mold is PO109 and is a four-cavity mold. Janetta's start pieces were 32 in box number 193. She ended her shift with box number 270, which had 20 pieces in it.

Manny is running machine 15. He is to package the parts 55 per box. The machine is running part number JDB102. The mold is 4727 and is a four-cavity mold. Manny's start pieces were 33 in box number 73. He ended his shift with box number 150, which had 38 pieces in it.

WEEKDAY
BOX COUNT WORKSHEET

DATE: ________________ SHIFT: *Number of your shift.* Q.C./P.I. ________________

MACH #	PART CODE	# OF CAV.	PIECES FULL BOX	START PCS PARTIAL BOX	END PCS PARTIAL BOX	START BOX #	END BOX #

Project Future
Competency Area 1.0: Language Skills

Competency Number 1.5: Complete Forms, Reports, and Letters

Lesson Number 1.5.3.: Complete an Incident Report Form

Lesson Objective: Given a scenario and an Incident Report Form, the trainee will complete the form using effective, concise phrases to complete the form.

Prerequisite Skills: The trainee must have the ability to write.
The trainee must have basic knowledge of common workplace safety.

Literacy Skills: The trainee will demonstrate correct English (grammar, spelling, punctuation, and capitalization) when writing concise sentences, clauses, and phrases.
The trainee will demonstrate ability to differentiate sentences and phrases.
The trainee will demonstrate the ability to organize and summarize information.
The trainee will differentiate between fact and opinion.

Presentation:

I. Using a cartoon cut from a newspaper or magazine, the trainer will stimulate discussion about the difference between fact and opinion. The trainer will lead trainees to determine that during a crisis or accident, reporting facts without opinions is extremely important. The reporting of opinions may prevent all facts from being considered.

II. Using the handout, Clauses and Phrases vs. Sentences, the trainer will discuss the difference between a phrase and a sentence. When might it be better to use a phrase than a sentence? What types of forms does the company have that might require phrases instead of sentences? Show copies of performance reviews, grievance forms, and Incident Reports.

III. The trainer will give the trainee a copy of a Quality Control requirement sheet. Divide trainees into groups of three and have them change the sentences to phrases. The trainees will cross out as many unnecessary words as possible. For example: Change "parts must be the correct color" to "parts must be correct color."

IV. The trainer will explain that Incident Reports are important for both the employee and the management. The report must contain complete and accurate information. The report must contain facts and not hypothesis or opinion. All blanks on the report must be filled. It is not always necessary to write complete sentences--clauses and phrases are effective and acceptable. Most companies require both the employee involved and the supervisor to fill out a report. Some companies also require observers to complete forms.

Evaluation: Trainees use the scenario given to complete an Incident Report Form, using effective, concise phrases.

Extension Activity: The trainee will summarize an article from either a newspaper or a magazine. The trainee will list the facts contained in the article in a numbered list. The trainees will edit their projects to make their sentences concise and accurate. The trainee will then re-write each of the facts in a way that expresses an opinion.

Clauses and Phrases vs. Sentences

A sentence is a group of words expressing a complete thought. It has both a subjext and a verb. Some examples of sentences are:

- Melted plastic is unbelievably hot. (subject – plastic; verb – is)
- Don't let yourself get careless and forget the tremendous temperatures and pressures that are at work in your molding machine. (understood subject – you; verb – do not let *and* forget)
- No one wants to hear a lecture on housekeeping. (subject – no one; verb – wants)
- No one wants to get hurt from a fall on small parts, pieces of scrap plastic, or spilled pellets. (subject – no one; verb – wants)
- Keep your work area clean. (understood subject – you; verb – keep)

A clause is a group of words that contains a verb and is used as part of a sentence. (A sentence is one type of clause. It is an independent clause. It can stand alone. It must be used within a sentence.) Some examples of clauses (clauses are shown in italics) are:

- *All injection molding machines must be equipped with safety devices.* (independent clause)
- Be smart and find *out where they are* and *how they work*. (dependent clauses)
- *When you start each shift*, check to see *if they are working*. (dependent clause)

A phrase is a group of related words that express a thought but do not contain a verb **and** its subject. Some examples of phrases are:

- Don't be the kind of indifferent worker who *avoids using safety glasses and ear protectors.*
- If you have a grinder *near your machine*, watch out.
- They like to throw small pieces back *in your face*.
- Keep your hands away *from the grinder*.

Practice

Tell whether each of the following is a sentence, a clause, or a phrase in each of the following examples by placing an *S* for sentences, a *C* for clauses, a *P* for phrases in the blank to the left of the example.

_____ 1. All the plastics that can be used in an injection-molding machine fall into two categories.

_____ 2. That are called thermoplastics and thermosets.

_____ 3. For injection molding

_____ 4. In injection molding, thermoplastics are more common than thermosets.

_____ 5. Thermosets are usually molded by a different molding technique.

_____ 6. Heat, the first phrase, of either type of plastic.

_____ 7. Heat softens the plastic material so it can be forced in to a mold.

_____ 8. In the mold, the similarity between thermoplastics and thermosets ends.

_____ 9. On the other hand

_____ 10. Once it sets or is cured

_____ 11. Thermosets cannot be reused once they have been molded.

_____ 12. A thermoplastic acts like candle wax.

_____ 13. Thermoplsatics can be melted, hardened, and re-melted many times.

_____ 14. If scrap thermoplastic is kept dry

_____ 15. If scrap thermoplastic is not damaged too much by heat

_____ 16. If scrap thermoplastic is not contaminated by dirt or non-compatible plastic resins, it can be reused.

_____ 17. This ground-up scrap, called regrind,

_____ 18. When these reground materials are reused

_____ 19. From your first day on the job, learn to conserve regrind.

_____ 20. Because it is valuable

Change the following phrases and clauses to full sentences.

1. When your machine is running steadily and producing high quality parts	A. you should do what ever you can to keep things moving.
2 If the machine is running slowly or shut down often	B. carelessness in materials handling is one of the reputations of a good worker in the eyes of your boss.
3 Because your company is interested In both a high volume and good-quality	C. it is profitable
4 Without making a profit	D. there is one problem you can control
5 Although not all machine slow downs or shut downs will be your fault,	E. your company and your job cannot exist.
6 Since it is one of the biggest problems in molding	F. it becomes costly.
7 Because no amount of molding skill can make up for dirty or wet material	G. the way you handle your molding materials is one of the best ways to control slow downs.

Practice

Tell whether each of the following is a sentence, a clause, or a phrase in each of the following examples by placing an *S* for sentences, a *C* for clauses, a *P* for phrases in the blank to the left of the example.

___*S*_ 1. All the plastics that can be used in an injection-molding machine fall into two categories.

___*C*_ 2. That are called thermoplastics and thermosets.

___*P*_ 3. For injection molding

___*S*_ 4. In injection molding, thermoplastics are more common than thermosets.

___*S*_ 5. Thermosets are usually molded by a different molding technique.

___*C*_ 6. Heat, the first phrase, of either type of plastic.

___*S*_ 7. Heat softens the plastic material so it can be forced in to a mold.

___*S*_ 8. In the mold, the similarity between thermoplastics and thermosets ends.

___*P*_ 9. On the other hand

___*C*_ 10. Once it sets or is cured

___*S*_ 11. Thermosets cannot be reused once they have been molded.

___*S*_ 12. A thermoplastic acts like candle wax.

___*S*_ 13. Thermoplsatics can be melted, hardened, and re-melted many times.

___*C*_ 14. If scrap thermoplastic is kept dry

___*C*_ 15. If scrap thermoplastic is not damaged too much by heat

___*S*_ 16. If scrap thermoplastic is not contaminated by dirt or non-compatible plastic resins, it can be reused.

___*P*_ 17. This ground-up scrap, called regrind,

___*C*_ 18. When these reground materials are reused

___*S*_ 19. From your first day on the job, learn to conserve regrind.

___C_ 20. Because it is valuable

Change the following phrases and clauses to full sentences.

1. When your machine is running steadily and producing high quality parts
2. If the machine is running slowly or shut down often
3. Because your company is interested In both a high volume and good-quality
4. Without making a profit
5. Although not all machine slow downs or shut downs will be your fault,
6. Since it is one of the biggest problems in molding
7. Because no amount of molding skill can make up for dirty or wet material

A. you should do what ever you can to keep things moving.

B. carelessness in materials handling is one of the reputations of a good worker in the eyes of your boss.

C. it is profitable

D. there is one problem you can control

E. your company and your job cannot exist.

F. it becomes costly.

G. the way you handle your molding materials is one of the best ways to control slow downs.

Incident Report

A report must be filled out by each employee involved in the incident. The report must be filed no later than 24 hours after the occurrence or event. In the case of severe injury, a 30-day extension is permitted with a written explanation from the treating physician. Failure to adhere to this policy may result in termination and/or loss of benefits.

Date: ______________________ Nature of Incident: ________________

Employees Involved: ________________________________

Were physical injuries involved? _____Yes _____No

If yes:

Nature of Injuries: ________________________________

Action(s) taken: ________________________________

Were observers present? _____Yes _____No

If yes, names of observers:

Signature of Employee

Signature of Supervisor

Accident Report

See, I was walking to my machine from the break room when I saw John Coleman zooming by in a forklift. I stopped to ask Julia a question about the part I was running before I went back to my machine. When I got to my machine there were a bunch of parts backed up. So, I started pulling the runners off of the parts when it happened. I bent down to pick up another set of parts and banged my head on the machine. I must have hit it hard because I don't remember anything after that until I saw Julia, Judy, Robyn, Joe, Steve and Nora standing over me. I must have blacked out for a couple of seconds. I stood up and tried to tell everyone I was OK. But then I put my hand to my head. When I pulled it away, I saw blood. Blood always makes me faint and I did. Fainted right there, fell on the floor all over again. Must have hit the back of my head pretty hard. Seems I was bleeding from the back of my head after that. That's when some one called the paramedics. I just stayed on the floor until they could carry me away on a stretcher. That's what happened as best as I can remember.

Project Future
Competency Area 1.0: Language Skills

Competency Number 1.5: Complete Forms, Reports, and Letters

Lesson Number 1.5.4.: Complete a Vacation Request Form

Lesson Objective: Given a Vacation Request Form, the trainee will complete the form using effective, concise phrases

Prerequisite Skill: The trainee must have the ability to read simple sentences.

Literacy Skills: The trainee will write or print legibly.
The trainee will identify types of sentences and will demonstrate proper punctuation skills.

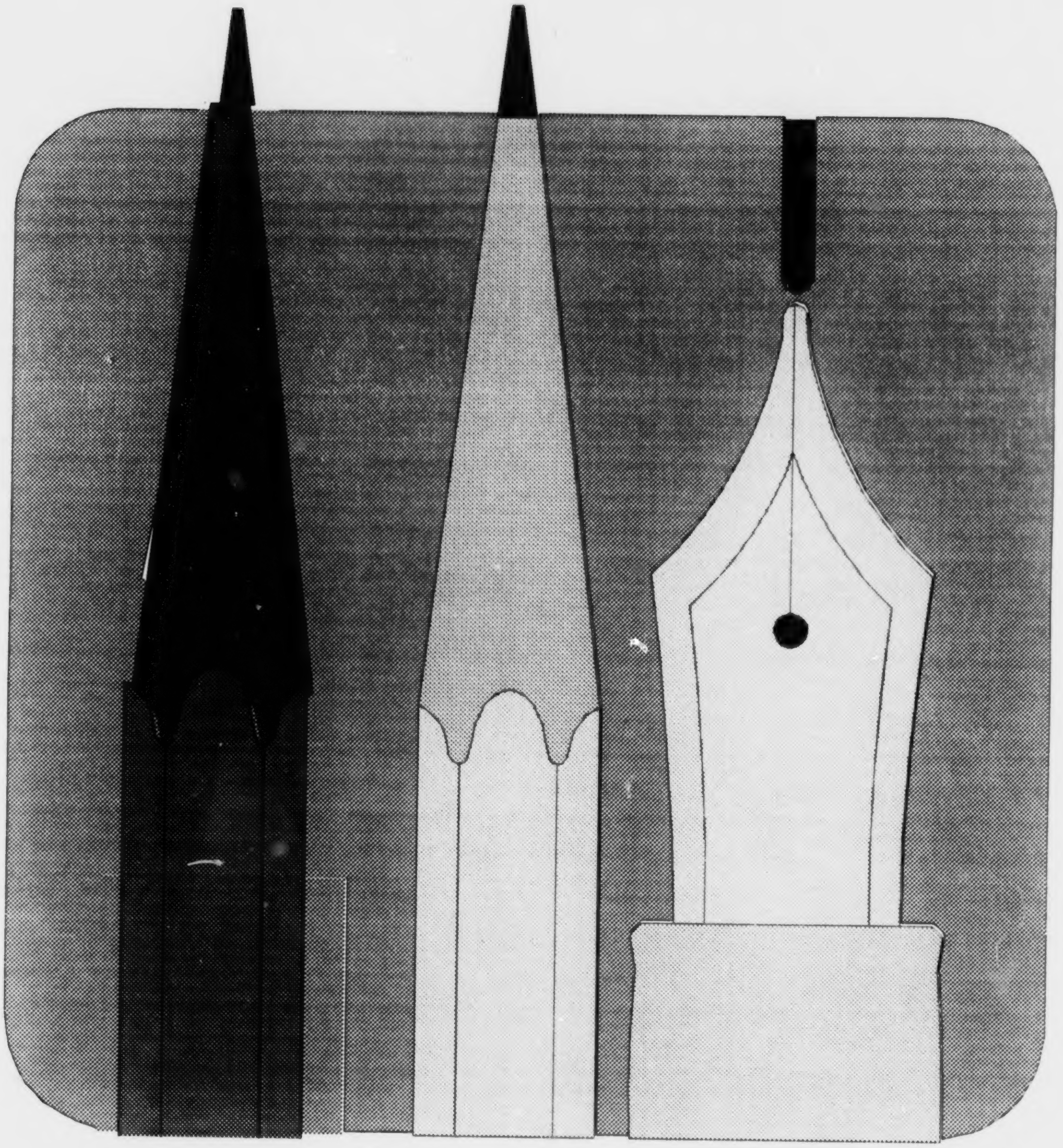
Presentation:

I. Using the handout, Writing Sentences with Confidence, the trainer will discuss the various types of sentences and their punctuation.

II. The trainees will use the guidelines in the handout to complete the exercise, Writing Complete Sentences.

Evaluation: The trainees will complete a Birthday Leave Request Form and a Vacation Request Form, using complete sentences to request the days. The trainer will review the form with the trainee.

Extension Activity: The trainees will complete a form for a library card and a Voter Registration Card.



Writing Sentences with Confidence

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Writing Sentences With Confidence

There are four types of sentences:

- Simple
- Compound
- Complex
- Compound-complex

A simple sentence has one subject and one verb.

Example: She operated the third machine.

The part of a sentence having a subject (what the sentence is about) and a verb (action word) is called a clause. A compound sentence has two main clauses. Either one of these clauses could be used alone and make sense.

Example: She operated the third machine, and she packaged the parts from two others.

The complex sentence also contains two clauses, but only one of the clauses could be used alone and make sense. The other clause would not make sense when it is used alone.

Example: She operated the third machine while she packaged parts. (The clause, “She operated the third machine,” would make a sensible sentence by itself. The clause, “while she packaged parts,” would not make sense if used by itself.

A compound-complex sentence contains two or more main clauses and one or more clauses that cannot stand alone.

Example: She operated the third machine, and she packaged the parts from machine two because the other operator was out sick. The first two clauses, “She operated the third machine” and “she packaged the parts from machine two,” are independent clauses that make sense when used alone. The third clause, “because the other operator was out sick” is a dependent clause because it cannot be used alone.

When writing for business purposes, it is better to combine several small simple sentences into compound and/or complex sentences.

Example: I would like the day off. I have worked many long days. I need a rest.
Better: I would like the day off to rest because I have worked many long days.

Practice

Each item below contains a clause. Put an *S* before the clauses that can stand alone. Because another name for a clause that cannot stand alone is a sentence fragment, place an F beside the clauses that cannot stand alone.

_____ 1. There is a best way to prevent problems over a machine's performance

_____ 2. By being very specific about requirements during the setup phase

_____ 3. Because the customer's specifications must be regarded as vital

_____ 4. The specification is the criteria against which the product will be judged

_____ 5. That a new three dial-automated count will be instituted

_____ 6. This problem took hours to resolve

_____ 7. When the problems have occurred

_____ 8. Operators must consult the QC Specification Sheet for measurements

_____ 9. If a higher level of rapid-fire obstructions occur

_____10. Do you want to prevent misunderstandings

When trying to decide if you have a sentence, read the sentence aloud and ask yourself whether this would make sense to you if someone said it to you.

Capitalization Rules

Capitalize the first letter in a sentence.
Examples: Here it is.
Today is the first day of the rest of your life.

Always capitalize the pronoun *I*.
Examples: My supervisor and I ate lunch together.
He and I attended class last night.

Use capitals for the names of specific persons, places, or things.

Examples:

Louisville
Kentucky
Ford
Futura Plastics
Jack Smith
England
Freedom Hall Arena
Michigan Avenue

Capitalize the first and last words and all important words in titles.

Examples:

book	*The Pelican Brief*
magazine	*Better Homes and Gardens*
CD	*Concert in Central Park*
song	"The Little Drummer Boy"
movie	*The Nutty Professor*
TV show	"Family Feud"

Capitalize the names of religions, nationalities, and races.

Examples:

They belong to the Baptist, Catholic, or Jewish faiths.
Yesterday we had Mexican food.
Who are the real Native Americans?

Capitalize the name of a family relationship when it is used with a person's name. Do not capitalize the name of a family relationship when it is not used with a person's name.

Examples:

I would like you to meet my Uncle Frank.
My uncle is not well.

Capitalize the names of companies and organizations.

Examples:

Futura Plastics
Society of Plastics Engineers
Walmart
Sears

Capitalize the days of the week and the months of the year.

Examples:

Sunday
Tuesday
Friday
May
July
September

Practice

Circle the letters that should be capitalized in the following sentences.

1. i really enjoyed the book, the chamber.

2. my aunt sylvia gave me a ride to work wednesday.

3. is nashville a large city?

4. I have always enjoyed futura plastic's company picnic at the mammoth cave national park.

5. I work with alex smith, joe jackson, mike butt, and ronnie montgomery.

Using the Correct Punctuation

The period: Use a period at the end of a sentence that makes a statement. The period is also used at the end of an abbreviation.

Example: The plastic is forced through the machine.
Mr. Smith
Dr. Brown
Washington, D.C. (District of Columbia)
Ave. (avenue) St. (street) Rd. (road)

The question mark: Use a question mark at the end of a sentence that asks something.

Example: Where are you going?

The exclamation mark: Use an exclamation mark when a sentence makes a statement but needs to show excitement. Caution! Exclamation marks are rarely used in business writing.

Example: Oh, no!
You are crazy!

Practice

Place the correct punctuation in the following sentences.

1. What a score

2. What is the score

3. I asked Dr Bishop what the score was

4. Is the pressure gage stuck

5. What are you going to do

6. Yea A new television for the break room

VACATION REQUEST

I WOULD LIKE TO REQUEST VACATION TIME ON THE DATE/DATES LISTED BELOW.

Starting: ______________________________

Ending : ______________________________

NUMBER OF VACATION DAYS REQUESTED ____________

I will return to work on: __________________________

______________________________ ______________
(Employee Signature) (Date)

____
FOREMAN'S SIGNATURE

BIRTHDAY REQUEST

I AM REQUESTING TO HAVE MY BIRTHDAY OFF.

____

________________________ ________________
EMPLOYEE SIGNATURE DATE

____
FOREMAN'S SIGNATURE

Project Future
Competency Area 1.0: Language Skills

Competency Number 1.5: Complete Forms, Reports, and Letters

Lesson Number 1.5.5.: Write a Memo Explaining Work Absence

Lesson Objective: Given a scenario, the trainee will write a memo explaining an absence from work, using correct form, complete sentences, and correct punctuation.

Prerequisite Skill: The trainee must be able to write complete sentences and use punctuation.

Literacy Skills: The trainee will demonstrate use of a standard business memo form.
The trainee will use correct sentence structure and punctuation.

Presentation:

I. Prior to class, the trainer will collect several copies of company memos and notices.

II. The trainer will explain that one of the most important ways a company communicates with its employees is through the use of memos and notices. Ask trainees to name the ways that the company distributes these important communications. The trainees may mention the following: place them in the envelopes with paychecks, by post them in a prominent place such as the break room or near the time clock, by having the supervisors hand them to each employee or by mail them to every employee. Ask trainees to determine why a particular method would be chosen.

III. Break the class into teams of three. Distribute to each of the teams copies of the memos collected before class. Ask the teams to summarize in no more than three sentences what each memo says. Have each team appoint a recorder, a reporter, and a timekeeper. Ask the teams to list any words that might be confusing to new employees. These words might include plastics specific vocabulary, jargon, or acronyms. The trainer may have to define these terms for the trainees and give examples.

IV. Have trainees report to the large group. List any terms on the board, and ask the group to define them.

Evaluation: The trainees will use the format contained in the handout, Reading Memos, to write a memo to the Human Resources manager explaining an absence from work.

Extension Activity: The trainees will write a memo to the editor of the local newspaper in reply to a recent letter or article.

MEMORANDUM

DATE: Date memo is written

TO: Name of person memo is being sent to

FROM: Name of person sending the memo

RE: Brief phrase stating the reason the memo is being written

Write what you have to say in brief, concise sentences. Memos should never be more than one page.

Project Future
Competency Area 1.0 : Language Skills

Competency Number 1.5:	Complete Forms, Reports, and Letters
Lesson Number 1.5.6.:	Write a Resume and a Letter of Application
Lesson Objective:	The trainees will write a resume and a letter of application.
Prerequisite Skill:	The trainee must be able to write complete sentences and use punctuation.
Literacy Skills:	The trainee will demonstrate use of a standard business letter form. The trainee will use correct sentence structure and punctuation. The trainee will use guidelines to produce a written product.

Presentation:

I. The trainer will explain that a resume is a document that reflects a person's work history, his/her objectives or goals for future work, and a list of people who would recommend the trainee for the job. Developing a resume is more than writing just a document. It is a process that begins with your first job. How you perform on that job determines the strength of the foundation on which your future work will be built. In other words, a resume can serve as a self-assessment of your work experience. It is important to maintain a current resume. A current resume will allow the trainee to apply for new positions as they become available. Ideally, the resume should be targeted to the job. A resume for a new position within a company would focus more on the accomplishments of the trainee in the jobs at the company. A resume for a job in a different company might highlight other skills.

II. The trainees will begin the resume writing process by selecting a target job (a job for which they wish to apply). Ask trainees to list the skills necessary to perform that job. Ask them to make two lists. One list contains the skills that are absolutely necessary for the minimal performance of the job. The other list contains the skills that would be desirable but not essential. Trainees may wish to refer to the job description that is located in the company's operating procedures manual. The trainee will place a check mark beside each of the skills he/she possesses.

III. The trainees will list the past jobs they have held, beginning with their present job and ending with the first job they held. For each of these jobs, the trainee will list the job skills he/she used on the job.

IV. The trainer will distribute copies of sample resumes to the trainees. Trainees will study these for form.

Evaluation: Using the handout, Writing a Resume for Success, the trainee will write his own resume and a letter of application to the company. If a computer is available, the trainee will type the resume. The trainer will meet with the trainee and critique the resume and letter for form and grammar errors.

Extension Activity: Using the handout, Writing a Letter of Application, and the local newspaper, the trainee will read the "help wanted" ads and will select an ad to, reply to with a resume and a letter of application.

Writing a Resume for Success

The resume is a summary of your education and work experience. Your resume is important. It might be the one thing an employer has that describes you. Some job advertisements will say, "Send resume." Even when jobs become available within a company, most companies will ask for some type of evidence that you are qualified to move into that position.

Resumes may be written in different ways or forms. Ideally, you should *target* your resume to the job. A resume for a new position within a company should focus more on the accomplishments of the trainee in jobs at the company. A resume for a job in a different company might highlight other skills.

Developing a resume is more than writing just a document: It is a process that begins with your first job. How you perform on that job determines the strength of the foundation on which your future work will be built. In other words, a resume can serve as a self-assessment of your work. If your work history is weak or if you have changed jobs frequently, you may want to consider staying in your present position until you have built a good record and have gained some references. Once you have written a resume, you should periodically update the resume.

Before you write your resume, ask yourself, "Why am I writing this resume? Do I want to get the position as Floor Attendant? Do I want to change companies?" Decide why. Next, research the targeted job. Read about it. If the job is within the company, find a job description and any job manuals that pertain to the job. This will help you know what qualities the boss is looking for.

There are different forms for resumes, but they all contain the following information. Remember that you should use all the space you need to tell your story, but that you should use as little space as possible. Employers have little patience with reading unless it is truly beneficial to them.

Format

Personal Information:	At the top of the resume, put your name, address, and telephone number. (If you do not have a telephone, this must be a number where you can be reached. Caution the person whose telephone number you give to be on the alert for a call. Ask for their help in making a good impression on the person calling.)
Job Objective:	What job do you want? Put the exact title if you know it. If you do not know the title, you may want to leave this out.

Work Experience:	Start with your present or most recent job and work backward, listing the jobs you have held. Briefly describe your duties. If you have a good work record, include how long you worked at each job. Use dates such as 1992-1994. If you have changed jobs often, you may want to leave out the dates. Include the name of your employer and their address. Figures don't brag. The most qualified people don't always get the job. It goes to the person who presents himself the best on paper. So don't just list where and what you did. Tell how well you did it. Give numbers, percentages, or increases in production, etc.
Educational Background	Give the name and location of each school you have attended. Give your major and minor (or vocational training), the degree, certificate or diploma you received. Give dates attended and your graduation date.
Special Skills:	List any special skills that you have obtained during your working career. Include on-the-job training, supervising, vocational classes, or other special skills. Arrange these so that the person reading your resume can locate them quickly.
References:	List at least three people who can comment on your work abilities and personality. If you cannot list employers, you may wish to use community leaders, former teachers, or your minister. List their names, addresses, and telephone numbers. IMPORTANT. Ask these people for their permission to use them as references *before* you do. Ask them if they would be willing to give you a *good* reference.

PROOFREAD! PROOFREAD! PROOFREAD! PROOFREAD! PROOFREAD!

Proofread every word. Begin at the last word and read the resume backward to check for typos. **Do not** trust a computer's spell-checking feature.

This is only a guide. You may have other ideas that will feature your best talents in an even better way. Whatever form you use, be sure to SELL! SELL! SELL YOURSELF!

FOR SALE

WORLD'S GREATEST
EMPLOYEE--ME

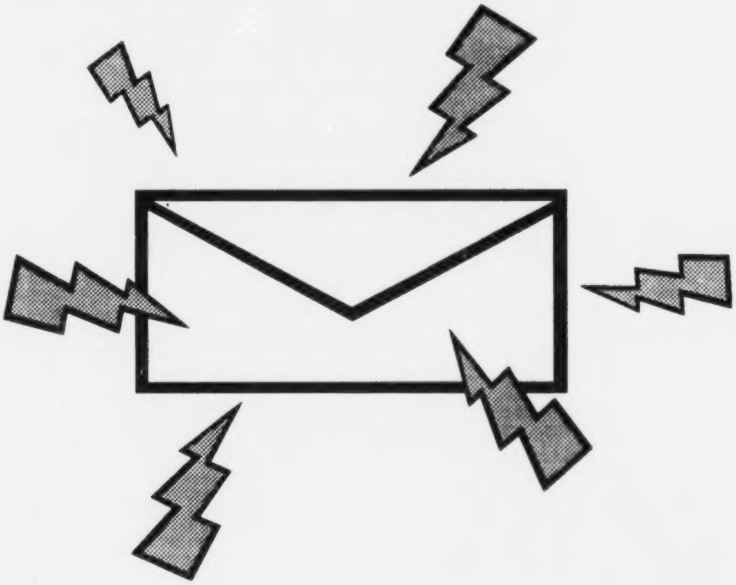
Writing a Letter of Application

A Letter of Application should contain three parts:

1. A statement of interest in a specific position (give the title);
2. A brief statement of your abilities for this position (including a comment about your enclosed resume); and
3. Information about how and where you can be reached.

Other tips:

- Try to get the name of a person. Write your letter to that person. Spell his or her name correctly.
- Avoid using Dear Sir or Madame.
- Quickly explain why you are the best person for the job.
- Your letter should be typewritten and neat, with no errors in spelling or typing. Do not trust a computer program's spell-checking feature.
- Use the proper business letter format (see page 2 of this handout).



Inter-company Letter of Application

123 Buford Drive
Louisville, KY 40235

August 22, 1995

Cindy McAlister
Human Resources Director
Futura Plastics and Engineering, Inc.
1920 Watterson Trail
Louisville, KY 40299

Dear Ms. McAlister:

Please consider this letter an application for the position of Second-Shift Floor Attendant which was posted in the break room on August 21.

I have been employed at Futura since May 1994. I have earned my world class designation as a press operator. On two shifts, I have filled in when floor attendants have been absent. The foreman complimented my efficiency and willingness to do whatever was necessary to keep the shift running smoothly.

I have completed the Skills Enhancement Training and Training for Success classes. A resume of my other training is attached.

I am currently working on first shift; however, I am flexible and would be happy to change to second shift as floor attendant. If given the opportunity, I would prove myself to be an even greater asset to my shift as floor attendant.

I would appreciate the opportunity to talk with you at your convenience.

Sincerely,

Jamael Humanie

123 Buford Drive
Louisville, KY 40235

August 22, 1995

John J. Personnel
Human Resources Director
Alcola Plastics and Design
1436 West Palm Beach
Louisville, KY 40298

Dear Mr. Personnel:

Please consider this letter an application for the plastics engineer trainee position advertised in the Sunday issue of *The Courier Journal* newspaper.

I graduated from Bill Cosby High School in May 1976, after completing a three-year internship in pre-engineering. My experience includes setting up and adjusting injection-molding machines in a factory setting. I am currently enrolled in night classes at John Henry Community College where I have completed one year of a two-year degree in plastics technology.

A resume of my high school and previous work experience is enclosed. If given the opportunity, I would prove myself an asset to your company.

I would appreciate the opportunity to talk with you at your convenience. I may be reached at the above address or by telephone (505-458-9908.

Sincerely,

Jamael Humanie

Project Future
Competency Area 2.0: Mathematics

Competency Number 2.1: Whole Numbers

Lesson Number 2.1.1: Accurately Read and Copy Numbers

Lesson Objective: Given an exercise, Preparing Labels Correctly, the trainee will be able to correctly complete a box label.

Prerequisite Skill: The trainee must be able to read.

Literacy Skills: The trainee will understand place value.
The trainee will demonstrate interpersonal communication skills.

Presentation:

I. Using the handout, Whole Numbers, Understanding Place Value, trainees will complete an exercise reviewing place value.

II. Trainer will break trainees into pairs. Pairs will read the numbers aloud to each other.

Evaluation: Trainees will complete the exercise, Preparing Labels Correctly. Trainees will self score by comparing with a correctly completed label.

Whole Numbers Review
Place Value

The term digit is used to identify a particular position in a number. For example, the first digit (single number or column) in the extreme right position of a number is referred to as the units digit. The digit in the next position to the left is in the tens column; the digit in the third position is in the hundreds column. The chart below shows the place names of commonly used digits. The way the numerals or digits are written in particular digit places gives the value of the number.

For example: the number 231 has an entirely different value if written as 321. We know that 321 dollars is a lot more than 231 dollars. As you can see, having the digits of the number in the proper position is very important.

Digit Place Names (Whole Numbers)						
Millions	Hundred Thousands	Ten Thousands	Thousands	Hundreds	Tens	Units or Ones
2	4	6	4	8	9	4
(This number is read as 2 million 4 hundred 64 thousand 8 hundred ninety four.)						

2,464,894 can be broken down as follows:

2 million	2,000,000
400 thousand	400,000
6 ten thousands	60,000
4 one thousands	4,000
8 one hundreds	800
9 tens	90
4 ones	4

Notice the placement of the commas. The commas help you to interpret the numbers more quickly because they divide off each section of the numerals. The hundreds are divided from the thousands; the thousands are divided from the millions, etc. You will also notice that the commas are used after every third numeral counting from the right to the left.

Whole Numbers, Understanding Place Value

Practice your skill at recognizing the place value of numbers by placing the digits of the following numbers in the correct column on the chart.

4568932
987564
907439
459784
458901
987539
987343
798316
786993
893211
889665
545689
901987
123231
325788
545978

Digit Place Names (Whole Numbers)						
Millions	Hundred Thousands	Ten Thousands	Thousands	Hundreds	Tens	Units or Ones

Practice writing the names of numbers by writing the names of the numbers listed below.

Example: 2,146,500 (Two million one hundred forty six thousand five hundred.)

455788

8569547

8789545

5235147

9781566

9545568

Write numbers for the following words (use commas where appropriate):

Five million one-hundred sixty-three thousand two hundred one

Seven hundred one thousand one

Eight hundred sixty-four

Twenty -three million

Two hundred million one hundred thousand one hundred one

Preparing Box Labels Correctly

When the company receives an order from a customer, it is likely to be just one of several orders for the same customer. It is extremely important for the customer to receive the exact product ordered at the right time. The customers' ability to complete their orders on time depends upon getting the part they need in time to complete the job they have promised to their customer. If the customer is late getting their customers' order completed, they may lose the account. When that happens, the supplying company loses the customer's account. Lost accounts can mean lost jobs.

When the incorrect parts are delivered to a company, the receiving company usually returns the shipment to the supplier and charges the supplier for the return shipment costs. There may also be provisions in the customer's contract for penalty charges that the supplier must pay to compensate the customer for lost production time and the labor associated with re-packing and return shipping the product.

Correctly completed box labels are vital to assuring that the correct parts are shipped to the correct customer. This label is placed on every box of parts before it is sealed and removed from the machine. In some companies, this label is completed by the Package Inspector or Quality Control personnel. In other companies, the label is completed by the molding press operator. In either case, each label must be checked for accuracy and must be corrected using information taken from the Box Count Sheet. Since the operator is the one person to see every label, it would be wise for the operator to check each label and to notify a supervisor when errors are found.

Look at the following example. Study the label until you understand how each block is to be completed.

<table>
<tr><td colspan="10">PART NO:</td><td colspan="9">BOX NO</td></tr>
<tr><td colspan="8" rowspan="2">QUANTITY</td><td colspan="11">DESCRIPTION:</td></tr>
<tr><td colspan="11">COLOR: PART CODE:</td></tr>
<tr><td colspan="9" rowspan="2"></td><td colspan="10">SUPPLIER:
FUTURA PLASTICS</td></tr>
<tr><td colspan="10">INSPECTOR:</td></tr>
<tr><td>JAN</td><td>FEB</td><td>MAR</td><td>APR</td><td>MAR</td><td>JUN</td><td>JUL</td><td>AUG</td><td>SEP</td><td>OCT</td><td>NOV</td><td>DEC</td><td colspan="7">COMPANY NAME:</td></tr>
<tr><td>SHIFT:</td><td>1</td><td>2</td><td>3</td><td>DATE:</td><td>1</td><td>2</td><td>3</td><td></td><td>1</td><td>2</td><td>3</td><td>4</td><td>5</td><td>6</td><td>7</td><td>8</td><td>9</td><td>0</td></tr>
</table>

Practice

Using the Box Count Sheet provided, complete the label below.

PART NO:	BOX NO
QUANTITY	DESCRIPTION:
	COLOR: PART CODE:
	SUPPLIER: **FUTURA PLASTICS**
	INSPECTOR:

JAN	FEB	MAR	APR	MAR	JUN	JUL	AUG	SEP	OCT	NOV	DEC	COMPANY NAME:

SHIFT:	1	2	3	DATE:	1	2	3		1	2	3	4	5	6	7	8	9	0

Place these numbers in the correct place on the sample Box Labels.

Part No.: ADB-8976
Box No.: 876
Quantity: 675
Description: Toe kick bracket
Color: Red
Part Code: 448994
Inspector: Your Name
Shift: Your Shift
Date: Today's Date

Part No.: IOUJ-90
Box No.: 12
Quantity: 24
Description: Shrink ring
Color: Blk
Part Code: 489900
Inspector: Your Name
Shift: Your Shift
Date: Today's Date

Part No.: ART98
Box No.: 122
Quantity: 89
Description: Brush Bush
Color: Wht
Part Code: 23421A
Inspector: Your Name
Shift: Your Shift
Date: Today's Date

Part No.: KIY987
Box No.: 231
Quantity: 1321
Description: Taper
Color: Gray
Part Code: 156650
Inspector: Your Name
Shift: Your Shift
Date: Today's Date

PART NO: *This number identifies the part by number.*	BOX NO: *This is the number of the box for the order*
QUANTITY: *This is the number of parts in the box.* *Example:*	DESCRIPTION: *This is a worded description of the part.* *Front Window*
	COLOR: *The color of the part--RED*
	PART CODE: *The code for the part--form Box Count Sheet*
	SUPPLIER: **FUTURA PLASTICS**
	INSPECTOR: *Quality Control Inspector signs here.*

Circle the name of the month.

J	F	M	A	M	J	J	A	S	O	N	D	COMPANY NAME:
A	E	A	P	A	U	U	U	E	C	O	E	
N	B	R	R	R	N	L	G	P	T	V	C	*Customer's Name*

SHIFT:	1	2	3	DATE:	1	[✓ 2]	3	[✓ 1]	2	3	4	5	6	7	8	9	0

Circle the shift numbe

Circle the date. Use the first 1,2,3, as the first digit of the dates beginning with 10 through 30. Circle the other digit of the date using the 1 through 0. For example, the date of the 21 is circled.

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BOX COUNT SHEET

PAGE ______ OF ______

MACHINE #: __________ PART CODE: ______________ DATE: ____________________

CUSTOMER: ______________________________ # OF CAVITIES ______________

PART #: ________________ COLOR ________________ AMOUNT ORDERED: ____________

PART NAME: __________________________ NO. OF BOXES NEEDED: ____________

NO. OF PARTS IN BOX: ________________ LABELS INCLUDED: YES ______ NO _____

NOTES: ____

SHIFT/ DATE	BOX #	C/O BOX QTY	HOLD
	961		
	962		
	963		
	964		
	965		
	966		
	967		
	968		
	969		
	970		
	971		
	972		
	973		
	974		
	975		
	976		
	977		
	978		
	979		
	980		

SHIFT/ DATE	BOX #	C/O BOX QTY	HOLD
	981		
	982		
	983		
	984		
	985		
	986		
	987		
	988		
	989		
	990		
	991		
	992		
	993		
	994		
	995		
	996		
	997		
	998		
	999		
	1000		

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Project Future
Competency Area 2.0: Mathematics

Competency Number 2.1: Whole Numbers

Lesson Number 2.1.2: Count Number of Parts Per Box

Lesson Objective: Given a Packaging Instruction Sheet, the trainee will be able to fill a box with the correct number of parts in the

proper configuration.

Prerequisite Skill: Trainee must be able to read.

Literacy Skills: Trainee will demonstrate counting skills.
Trainee will follow directions.

Presentation:

I. Prior to class, the trainer will collect enough parts to fill one layer of a box of parts. The trainer also will collect the appropriate box and dividers.

II. Using the handout, Counting Hints, the trainer will read through the handout with the trainees.

Evaluation: Using the Packaging Instructions, the trainees will practice packing the box according to the directions on the instruction sheet. As a follow-up of lesson 2.1.1, have trainees check the packaging label for accuracy.

Extension Activity: The trainees will count the number of stops on a bus schedule.

Counting Hints

Shipping the correct number of parts is critical to the profit margin of the company. If too many parts are shipped in a box, the company loses not only the profit from that part but the cost of the labor, material, and machine hours that went into making the part. If too many parts are shipped in a box, the customer may decide to discontinue their orders with the company because their production has been harmed.

The following list gives suggestions for making a correct count:

1. **Read the packaging instructions carefully. Ask any questions at the beginning of your shift.**

2. **Concentrate on the task at hand.** Do not let your mind wander to the events of last night or tonight. Think only about the task of counting and checking the parts.

3. **Block out noise of surrounding machinery.** Use ear plugs if necessary.

4. **Develop a plan for the times when you lose count.** Look for a pattern in the ways the parts are arranged. If there are to be 20 parts in each row and there are two rows in the box, you can double check your counting by seeing if the two rows are even.

5. **Keep a pencil and a pad of paper at your machine.** When you are interrupted, make a note on the pad so that you will know how many parts you have in the box.

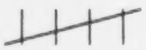
6. **If you are uncertain about whether you have packed your first box correctly, ask a supervisor to check the box.** Do this on the first box. Do not wait until you have filled six or eight boxes incorrectly to find out.

7. **If you must pack left and right sides of a part together; be careful to separate them according to the instructions.**

8. **If you end up with a box that is not completely packaged, something is probably wrong.** Remember that it is to the advantage of the company to fill boxes completely full. Have your supervisor check whether you are following directions correctly.

9. **If you are counting number of defective parts on a Reject Sheet, you will record each reject in a box under the name of the defect by using a hash mark.** On the fifth reject, you will draw a diagonal line through the first four.

Example:



This indicates that you have had five rejects.

10. **Before the Floor Attendant removes your skids of boxes, be sure to double check that you have the correct number of boxes on the skid.** The way boxes of parts are stacked on a skid follows a pattern, just as the way parts are packed in the boxes.

PACKAGING INSTRUCTIONS

Customer: ____ Part No.: 80-02708-01 Revision: ____ Date: ____
Operation No.: ____ Part Name: SRM180 Container Prepared By: ____ Date: ____
Mold No.: ____ Part Code: SFT 07 Approved By: ____ Date: ____
Number of Cavities: ____ Standard Part Weight: ____ Customer Approval: ____ Date: ____

1) W/P Label

2) 40 X 48 Jones Lids

- Place open end down side by side for 11 pcs. per row.
- Thus having 5 rows of 11 and 5 parts on the end turned 180° for 60 pcs. per layer
- Place lid over bottom layer and fill the second layer for a total of 120 pcs. per skid.

Project Future
Competency Area 2.0: Mathematics

Competency Number 2.1: Whole Numbers

Lesson Number 2.1.3: Determine the Total Pieces Produced Per Shift.

Lesson Objective: Given a Production Report, the trainees will correctly complete 10 of 15 problems from a worksheet.

Prerequisite Skill: The trainee must have an understanding of basic addition facts and place value.

Literacy Skills:
The trainee will read plastics terms.
The trainee will add one to five digit numbers.
The trainee will read a spreadsheet.

Presentation:

I. Prior to class, the trainer will collect a current Production Report for the trainee's shift. The trainees will use this report to practice understanding the sheet's categories.

II. Using the exercise, Review of Whole Number Addition, the trainees will practice computation skills.

Evaluation: Using the Production Report, the trainee will complete the worksheet, Production Report Totals.

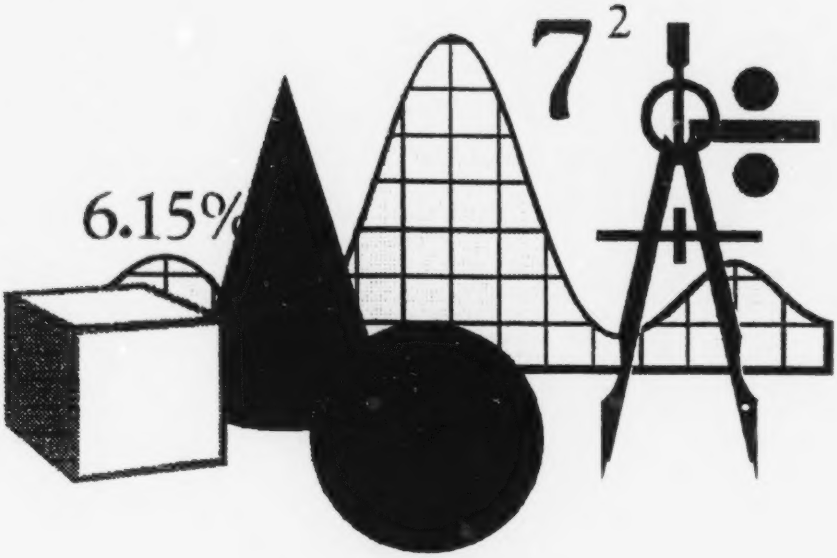
Extension Activity: The trainee will list his/her expenses and his/her income for the past three months in two columns. He/she will add the columns and compare.

Tips For Adding Whole Numbers

1. Write the numbers one under another with each digit in the proper column.
2. Add all the numbers in the ones (units) column.
3. Write the last numeral on the right in the units column.
4. Carry the remaining numeral on the left to the tens column and add it with the rest of the numbers in this column.
5. Continue the same process with the remaining columns.

Example:

$$\begin{array}{r} \overset{1}{1}\overset{1}{5}5 \\ \underline{+246} \\ 401 \end{array}$$



Review of Whole Number Addition

This exercise will give you a quick review of your addition skills.

ADD:

1	12	773	6656	36847	47368
+3	+78	+343	+5658	+45655	+78665

4	33	756	3786	48498	464565
+5	+88	+756	+ 978	+77895	+ 78979

4564	455	45658	789	5588	99658
2565	557	75857	55	878	78684
+454	+4654	+ 77	+4888	+78454	+6447

43 + 789 + 44 =

56554 + 545 + 54 + 8 =

On Friday, there were 18 operators on first shift, 17 operators on second shift, and 14 operators on third shift. How many operators worked Friday?

There were 14 boxes of product shipped on Tuesday and 18 boxes shipped on Thursday. How many boxes of product were shipped?

The supervisor told you to get 24 boxes for machine number 14, 12 boxes for machine number 12, and 10 boxes for machine number 3. How many boxes did your supervisor ask you to get?

How many hours did Tim work if he worked the following hours:

Monday	7 hours
Tuesday	6 hours
Wednesday	7 hours
Thursday	8 hours
Friday	8 hours
Saturday	8 hours

Check your answers with the answer sheet. Correct any problems you missed.

PRODUCTION REPORT FOR 08-MAY-95 SHIFT #1

MACH NO.	PART CODE	DESCRIPTION	AVG CYC	STD CYC	TOTAL SHOTS	OPTM PROD	ACT PROD	SCRAP PARTS	TOTAL LOSS	% SCRAP	% LOSS	HRS UP	DOLLARS SALES	$/ HR	SELLING PRICE	SCRAP DOLLARS
1	RAS04	6591-11-1104-4115 A/	28.0	30.0	916	854	771	145	83	15.0	9.8	7.1	$353.80	$40.68	$458.88	$66.54
2	FIS79	70077-9663YLPEG/3837	51.7	47.0	544	598	476	68	122	12.5	20.4	7.0	$877.82	$34.72	$1844.15	$125.40
3	IPM03	R5942 1 1/4 BLACK SI	48.7	45.0	468	1013	940	0	73	0.0	7.2	6.3	$734.85	$55.78	$781.75	$0.00
4	FIS87	70077-9423 ASSY TABL	53.1	43.0	539	666	505	34	161	6.3	24.1	8.0	$1127.12	$38.78	$2231.92	$75.89
5	FISA3	70079-1531 MT BASE	48.6	45.0	375	810	655	95	155	12.7	19.1	5.1	$828.38	$38.54	$1264.70	$120.15
6	GEN02	162D3835P004 COV HIN	32.7	20.0	836	5465	3335	9	2130	0.3	39.0	7.6	$401.50	$24.52	$120.39	$1.08
9	HAM01	CLIP	29.5	28.0	918	3867	3400	272	467	7.4	12.1	7.5	$179.01	$19.89	$52.65	$14.32
10	WES27	EN10142 BASE	102.1	100.0	43	44	33	10	11	23.3	24.9	1.2	$96.50	$42.21	$2924.20	$29.24
11	ATG05	BELT LINK HUMP/AQUA	52.9	45.0	336	1581	840	504	741	37.5	46.9	4.9	$369.63	$55.84	$440.04	$221.78
13	FIS31	70082-7418 USA BLUE	28.3	35.0	993	3209	2510	1462	699	36.8	21.8	7.8	$545.20	$53.16	$217.21	$317.56
14	DUV08	CD4061 6 PC COMBO	48.0	50.0	569	546	531	38	15	6.7	2.7	7.6	$769.95	$94.24	$1450.00	$55.10
15	REL49	42169 BODY W/LENS	50.4	45.0	311	348	297	14	51	4.5	14.7	4.4	$385.37	$52.59	$1297.55	$18.17
16	ICS21	STAB. RED COKE/1230	46.2	35.0	623	822	826	0	0	0.0	0.0	8.0	$305.62	$38.25	$370.00	$0.00
17	FISA4	SEAT 2331/PED 2493	37.0	30.0	747	1841	1202	292	639	19.5	34.7	7.7	$596.76	$14.47	$496.47	$144.97
18	FIS82	70086-5261/71/81	36.1	36.0	797	799	789	8	10	1.0	1.3	8.0	$729.63	$42.55	$924.75	$7.40
20	FIS89	70091-0603	48.6	45.0	590	637	564	26	73	4.4	11.4	8.0	$962.67	$46.21	$1706.86	$44.38
21	RAS11	6591-11-1404-4111 W/	36.4	27.0	308	829	466	150	363	24.4	43.8	3.1	$163.10	$24.30	$350.00	$52.50
22	GEN07	162D5683P003 WP/663	55.4	55.0	446	898	796	96	102	10.8	11.4	6.9	$712.10	$37.68	$894.60	$85.88
23	ICS03	STAB. RED COKE/1228	43.1	35.0	61	75	141	0	0	0.0	0.0	0.7	$52.17	$71.47	$370.00	$0.00
10	WES11	EN10098 LG. BASE	125.2	91.0	23	32	23	0	9	0.0	27.3	0.8	$77.05	$42.43	$3350.00	$0.00

Shift Analyzation

Shift Total Scrap Dollars.........: $1380.35
Shift Average Scrap Percentage....: 11.2%
Shift Scrap Percentage............: 14.4%
Shift Loss Percentage.............: 23.7%
Shift Machine Utilization.........: 64.3%
Shift Productivity................: 76.6%
Average Machine Rate.(Uptime Hrs).: $40.77
Total Machine Hours...............: 118.38
Total Dollar Sales................: $10,268.21
Total Dollars Contribution........: $4,826.76

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Production Report Totals

The Production Report is used to give a snapshot of what happened during each shift. The report is a spreadsheet that tells how well the machines performed on each product. This sheet is used as a tool for decision making. Does the manager need to move the mold to a machine that can have a faster cycle time? Does the customer quote need to be looked at because the quoted rate is impossible to meet?

Answer the following questions about the Production Report you have been given.

1. What is the part code for machine number 3?
2. What is the average cycle for FIS82?
3. What was the total loss for machine 23?
4. What machine was the SEAT 2331/PED 2493 produced on?
5. What were the scrap dollars for machine 18?

Now that you have practiced locating information on the Production Report, complete the following problems using information located on the Production Report.

1. What is the total number of shots from machines 1 and 15?
2. What is the sum of the optimum production of machines 21,23, and 10?
3. What would the number of shots be if the number of shots from machine number 14 were increased by 123?
4. What is the sum of the scrap parts from machines 1 through 5?
5. What is the total of the average cycles of the machines that produced the Stab. Red Coke parts?
6. How many Stab. Red Coke parts were produced on the shift?
7. How many parts were produced at the company on the shift?
8. What was the total number of pieces lost on the shift?
9. How many total hours were the machines up on the shift?

What was the actual production of machines number 18, 23, 2, and 11?

Project Future
Competency Area 2.0: Mathematics

Competency Number 2.1: Whole Numbers

Lesson Number 2.1.4: Determine the Difference between the Total Shots and the Actual Production.

Lesson Objective: Given a Production Report, the trainees will correctly complete 10 of 15 problems from a worksheet.

Prerequisite Skill: The trainee must have a basic understanding of basic addition and subtraction facts and place value.

Literacy Skills:
The trainee will read and follow directions.
The trainee will read a spread sheet.
The trainee will subtract one to five digit numbers.

Presentation:

I. Prior to class, the trainer will collect a current Production Report for the trainee's shift. The trainees will use this report to practice understanding the sheet's categories.

II. Using the exercise, Review of Whole Number Subtraction, the trainees will practice computation skills.

Evaluation: Using the Production Report, the trainee will complete the worksheet, Production Report Differences.

Extension Activity: The trainee will calculate the number of vacation and sick days he/she has left.

Review of Whole Number Subtraction

This exercise will give you a quick review of your subtraction skills.

SUBTRACT:

5	23	456	5666	78368
-3	-12	-232	-1555	-68245
58	965	56465	54654	96465
-7	-567	-4978	-23445	-87937
8965	78978	44564	778988	8874
-7656	- 987	-6568	-696873	-4567

58358 - 5687 =

2546478 - 1489 =

Answer the following questions:

On Friday, 56 people reported for work on first shift. A water outage forced 27 employees to leave. How many people were left?

There were 48 boxes of SAFT on the loading dock. There were also 29 boxes of FIS828 on the loading dock. How many more boxes of SAFT than the FIS 828 were on the loading dock?

On Monday 458 boxes of parts were in the red-tag hold area. On Wednesday there were 198 boxes left in the hold area. How many boxes were removed from the hold area?

If the beginning reading on the counter was 4,856 shots and the ending reading was 9,678, how may parts were produced during the shift?

If you worked 48 hours but were paid for 46 hours, how many hours pay are you short?

If machine 14 produced 4,568 parts on the first shift and 4,328 parts on the third shift, what is the difference in the number of parts produced?

Check your answers with the answer sheet. Correct any problems you missed.

Production Report Figures

The Production Report is used to give a snap shot of what happened during each shift. The report is a spreadsheet that tells how well the machines performed on each product. As we have said before the Production Report is one report that management uses for decision making. Learning to read the Production Reports and analyze them will help you learn about the company.

Answer the following questions about the Production Report you have been given. For purposes of this practice assume that all shifts had identical production. This will never actually happen. Why?

1. What is the difference between the total number of shots and the optimum production on machine 1?
2. What difference between the optimum production and the actual production on Machine 1?
3. How much greater is the optimum production than the actual production on machine 13?
4. What is the difference in the standard cycle and the average cycle on machine 1?
5. How much greater is the average cycle and the standard cycle on machine 21?
6. What is the difference in the average cycle and the standard cycle on machine 15?
7. What is the difference in the average cycle and the standard cycle on machine 10 when it produced WES11?
8. How much greater is the number of total shots and the actual production on machine 1?
9. What is the difference in the number of total shots and the actual production on machine 4?
10. What is the difference in the number of total shots and the actual production of DOV08?
11. How much greater is the number of total shots and the actual production on machine 10 WES11?
12. What is the difference in the actual production and the number of total shots of GEN07?
13. What is the difference in the scrap parts and the total loss of RAS04?
14. What is the difference in the total dollar sales and the total dollars contribution for the shift in whole numbers (leave off the decimals)?
15. What is the difference in the total loss for FIS79 and KDL49?

Project Future
Competency Area 2.0: Mathematics

Competency Number 2.1: Whole Numbers

Lesson Number 2.1.5: Determine the Daily Production

Lesson Objective: Given a Production Report, the trainees will correctly complete 10 of 15 problems from a worksheet.

Prerequisite Skills: The trainee must have knowledge of addition, subtraction, and the multiplication tables.
The trainee must be able to read.

Literacy Skills: The trainee will locate information on a spreadsheet.
The trainee will compute using multiplication facts.
The trainee will read and follow instructions.

Presentation:

I. Prior to class, the trainer will collect a Production Report for each shift for one week. The trainees will use these reports to complete the exercise.

II. Using the exercise, Review of Whole Numbers Multiplication, the trainees will practice computation skills.

Evaluation: Using the Production Report, the trainee will complete the worksheet, Production Report Results.

Extension Activity: The trainees will practice multiplication computation skills by determining their salaries for the next year.

PRODUCTION REPORT FOR 08-MAY-95 SHIFT #1

83.7

MACH NO.	PART CODE	DESCRIPTION	AVG CYC	STD CYC	TOTAL SHOTS	OPTM PROD	ACT PROD	SCRAP PARTS	TOTAL LOSS	% SCRAP	% LOSS	HRS UP	DOLLARS SALES	$/ HR	SELLING PRICE	SCRAP DOLLARS
1	RAS04	6591-11-1104-4115 A/	28.0	30.0	916	854	771	145	83	15.8	9.8	7.1	$353.80	$40.68	$458.88	$66.54
2	FIS79	70077-9663YLPEG/3837	51.7	47.0	544	598	476	68	122	12.5	20.4	7.8	$877.82	$34.72	$1844.15	$125.40
3	HUD03	R5942 1 1/4 BLACK ST	48.7	45.0	468	1013	940	0	73	0.0	7.2	6.3	$734.85	$55.78	$781.75	$0.00
4	FIS87	70077-9423 ASSY TABL	53.1	43.0	539	666	505	34	161	6.3	24.1	8.0	$1127.12	$38.78	$2231.92	$75.89
5	FISA3	70079-1531 MT BASE	48.6	45.0	375	810	655	95	155	12.7	19.1	5.1	$828.38	$38.54	$1264.70	$120.15
6	GEN02	162D3835P004 COV HIN	32.7	20.0	836	5465	3335	9	2130	0.3	39.0	7.6	$401.50	$24.52	$120.39	$1.08
9	HAM01	CLIP	29.5	28.0	918	3867	3400	272	467	7.4	12.1	7.5	$179.01	$19.89	$52.65	$14.32
10	WES27	EN10142 BASE	102.1	100.0	43	44	33	10	11	23.3	24.9	1.2	$96.50	$42.21	$2924.20	$29.24
11	ATG05	BELT LINK HUMP/AQUA	52.9	45.0	336	1581	840	504	741	37.5	46.9	4.9	$369.63	$55.84	$440.04	$221.78
13	FIS31	70082-7418 USA BLUE	28.3	35.0	993	3209	2510	1462	699	36.8	21.8	7.8	$545.20	$33.16	$217.21	$317.56
14	DUV08	C04061 6 PC COMBO	48.0	50.0	569	546	531	38	15	6.7	2.7	7.6	$769.95	$94.24	$1450.00	$55.10
15	KOL49	42169 BODY W/LENS	50.4	45.0	311	348	297	14	51	4.5	14.7	4.4	$385.37	$52.59	$1297.55	$18.17
16	ICS21	STAB. RED COKE/1230	46.2	35.0	623	822	826	0	0	0.0	0.0	8.0	$305.62	$38.25	$370.00	$0.00
17	FISA4	SEAT 2331/PED 2493	37.0	30.0	747	1841	1202	292	639	19.5	34.7	7.7	$596.76	$14.47	$496.47	$144.97
18	FIS82	70086-5261/71/81	36.1	36.0	797	799	789	8	10	1.0	1.3	8.0	$729.63	$42.55	$924.75	$7.40
20	FIS89	70091-0603	48.6	45.0	590	637	564	26	73	4.4	11.4	8.0	$962.67	$46.21	$1706.86	$44.38
21	RAS11	6591-11-1404-4111 W/	36.4	27.0	308	829	466	150	363	24.4	43.8	3.1	$163.10	$24.30	$350.00	$52.50
22	GEN07	162D5683P003 WP/663	55.4	55.0	446	898	796	96	102	10.8	11.4	6.9	$712.10	$37.68	$894.60	$85.88
23	ICS03	STAB. RED COKE/1228	43.1	35.0	61	75	141	0	0	0.0	0.0	0.7	$52.17	$71.47	$370.00	$0.00
10	WES11	EN10098 LG. BASE	125.2	91.0	23	32	23	0	9	0.0	27.3	0.8	$77.05	$42.43	$3350.00	$0.00

Shift Analyzation

Shift Total Scrap Dollars.........: $1380.35
Shift Average Scrap Percentage....: 11.2%
Shift Scrap Percentage............: 14.4%
Shift Loss Percentage.............: 23.7%
Shift Machine Utilization.........: 64.3%
Shift Productivity................: 76.6%
Average Machine Rate.(Uptime Hrs).: $40.77
Total Machine Hours...............: 118.38
Total Dollar Sales................: $10,268.21
Total Dollars Contribution........: $4,826.76

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Review of Whole Numbers Multiplication

This exercise will give you a quick review of your multiplication skills.

MULTIPLY:

4 x 5	61 x 8	87 x 79	654 x 978	5763 x 589	73 x 17
8 x 9	79 x 87	645 x 20	4894 x 789	76887 x 79	788 x 60
456 x 1	789 x 38	45 x 6	5463 x 75	3181 x 100	87877 x 1000

2 x 3 x 4 x 5 =   478 x 581 x3 =   768 x 91 x 21 =   28 x 85 x 42 =

Answer the following questions.

Futura Plastics sold 853 boxes of product XYS 874; each of the boxes had 36 parts in it. How many parts of XYS 874 did Futura sell?

There were 48 boxes of SAFT on the loading dock. There were also 29 boxes of FIS868 on the loading dock. Each of the SAFT boxes holds 24 pieces, and each of the FIS 868 boxes holds 48 pieces. How many parts were on the loading dock?

There were 83 Gaylord boxes of resin in the warehouse. If each Gaylord weighs approximately 100 pounds, how much resin is in the warehouse?

If the Shipping Department ships 165 boxes per day, how many boxes do they ship per week?

If you worked eight hours per day for one work week (five days), how many hours have you worked?

If you were paid $5.50 per hour and you worked 32 hours, how much would you earn?

Check your answers with the answer sheet. Correct any problems you missed.

Production Report Results

Determining the daily production for each machine and each shift is vital to determine the productivity and efficiency of the company.

Use multiplication to answer the following questions about the Production Report you have been given.

1. If there were 916 shots on each of the three shifts, how many shots were made for the entire day?
2. If the scrap parts on machine 1 remained the same for an entire week for this shift, how many scrap parts would be produced?
3. If the production for FIS79 was maintained at the optimum rate for all shifts for two business weeks (a business week is five days), how many pieces would be produced?
4. The average cycle on part code 70077-9663YLPEG/3837 is 51.7. If it were changed to a two-part mold, how many parts would it produce in an hour? In a day? In a week? In a year? (Assume a seven day week.)
5. How many times would the mold on machine 1 open during one hour on this shift if it remained on the quoted (standard) cycle?
6. If the other two shifts have the same number of total scrap dollars, how many scrap dollars will the company produce on this date?
7. If this shift maintains the same dollars contribution per day for one five-day work week, how many dollars contribution will this shift contribute to the company?
8. If this shift maintains the same dollars contribution per day for each five-day work week for an entire year (remember that a year has 52 weeks--assume no shut-downs), how many dollars contribution will this shift contribute to the company?
9. If the total machine hours remained the same for 14 days, how many machine hours would this shift contribute to the company?
10. If machine 10 had been running for the entire eight hours, how many dollars in sales would Machine 10 have contributed to the company?
11. If HUD03 is a two-part mold and there are 465 shots made in an hour, how many parts are produced per hour.

12. If HUD03 is a four-part mold and there are 465 shots made in an hour, how many parts are produced in a day.

13. If Seat 2331/Red/2493 upped their production to 112 shots per hour (remember it is a two-part mold), how many pieces would be produced on the shift?

14. If WES11 continues to make $77 per hour, how much will the machine make for the seven day week if there is no down time?

15. If machine 2 maintains optimum production for each of the three shifts, how many parts will it produce?

Project Future
Competency Area 2.0: Mathematics

Competency Number 2.1: Whole Numbers

Lesson Number 2.1.6: Determine the Average Scrap Dollars

Lesson Objective: Given a Production Report, the trainees will correctly complete 10 of 15 problems from a worksheet.

Prerequisite Skills: The trainee must have knowledge of addition, subtraction, and the multiplication tables.
The trainee must be able to read.

Literacy Skills: The trainee will locate information on a spreadsheet.
The trainee will compute using multiplication facts and division concepts.
The trainee will read and follow instructions.

Presentation:

I. Prior to class, the trainer will collect a Production Report for each shift for one week. The trainees will use these reports to complete the exercise.

II. Using the exercise, Review of Whole Numbers Division, the trainees will practice computation skills.

Evaluation: Using the Production Report, the trainee will complete the worksheet, Production Report Scrap Dollars.

Extension Activity: Using his previous months Earnings Statements, the trainee will determine his average monthly salary.

Review of Whole Numbers Division

This exercise will give you a quick review of your division skills.

Divide:

9 ÷ 3 =   27 ÷ 9 =   4 ÷ 2 =   16 ÷ 4 =   20 ÷ 5 =

81 ÷ 9 =   12 ÷ 3 =   **33 ÷ 11 =**   **64 ÷ 8 =**   **64 ÷ 2 =**

12)645   **23) 12342**   **64) 12567**   **35) 1085**   **43) 3938**

Answer the following questions.

If a machine produces an average of 890 parts per hour, how long will it take to produce 14,240 parts?

If a part weighs 80 ounces and there are 16 ounces in each pound, how many pounds does the part weigh?

If a box is 75 inches long and there are 12 inches in a foot, how many feet long is the box?

Futura buys the same small quantity of particular resin each month. They pay $12, 863 a year for the resin. How much do they pay for the resin each month?

David worked 40 hours last week and was paid $385 for the week. How much si David's hourly pay?

If the resin to make 180 parts costs $36, how much does the resin cost to make one part?

Jacalane's machine produces 23,897 parts on her shift. How many parts per hour did the machine produce?

Jamal's telephone bill was $320 last year. How much was his average monthly bill?

Product Report Scrap Dollars

Practice your division skills by answering the following questions about the Production Report that is attached.

1. What is the average scrap dollar amount for this shift? Add all the scrap dollars together and divide by the number of machines.
2. Since HUD03 made 299 shots and produced 564 parts, how many parts must the mold be?
3. Machine 6 produced 3,629 parts. There were 873 shots. How many parts are produced per shot?
4. Calculate the average dollar sales for the shift.
5. Calculate the average number of scrap parts for the shift.
6. What is the average dollars per hour contribution for this shift?
7. If the actual production is 1,880 parts and 399 shots were made, how many parts does the mold produce with each shot?
8. If the optimum production is 1,277 parts and 617 shots were made, how many parts does the mold produce with each shot?
9. Divide the optimum production on KDL49 by the actual production.
10. What is the total dollar sales average per hour for this shift?
11. If the standard cycle is 20 seconds, how many shots are made per minute?
12. If the standard cycle is 20 seconds, how many shots are made per hour?
13. If the standard cycle is 30 seconds, how many shots are made per shift?
14. If the standard cycle is 30 seconds, how many shots are made per day?
15. What is the average number of hours up, per machine, on this shift?

1

PRODUCTION REPORT FOR 08-MAY-95 SHIFT #3

MACH NO.	PART CODE	DESCRIPTION	AVG CYC	STD CYC	TOTAL SHOTS	OPTM PROD	ACT PROD	SCRAP PARTS	TOTAL LOSS	% SCRAP	% LOSS	HRS UP	DOLLARS SALES	$/ HR	SELLING PRICE	SCRAP DOLLARS
1	RAS04	6591-11-1104-4115 A/	27.9	30.0	1031	959	962	69	0	6.7	0.0	8.0	$441.44	$45.24	$458.88	$31.66
2	FIS79	70077-9663YLPEG/3837	54.8	47.0	499	582	318	181	264	36.3	45.4	7.6	$586.44	$23.84	$1844.15	$333.79
3	HUD03	R5942 1 1/4 BLACK SI	49.8	45.0	299	662	564	34	98	5.7	14.9	4.1	$440.91	$51.17	$781.75	$26.58
4	FIS87	70077-9423 ASSY TABL	53.0	43.0	541	667	516	25	151	4.6	22.7	8.0	$1151.67	$39.53	$2231.92	$55.80
5	FIS83	70079-1531 MT BASE	46.6	45.0	617	1277	599	635	678	51.5	53.1	8.0	$757.56	$22.35	$1264.70	$803.08
6	GEN02	162D3835P004 COV HIN	32.7	20.0	873	5702	3629	0	2073	0.0	36.4	7.9	$436.90	$25.58	$120.39	$0.00
9	HAM01	CLIP	30.4	28.0	946	4104	2000	1784	2104	47.1	51.3	8.0	$105.30	$11.03	$52.65	$93.93
10	WES27	EN10142 BASE	112.7	100.0	185	208	155	30	53	16.2	25.6	5.8	$453.25	$41.77	$2924.20	$87.73
11	AIG05	BELT LINK HUMP/AQUA	56.8	45.0	399	2013	1880	0	133	0.0	6.6	6.3	$827.28	$98.16	$440.04	$0.00
13	FIS31	70082-7418 USA BLUE	27.0	35.0	1066	3287	2739	1525	548	35.8	16.7	8.0	$594.94	$35.33	$217.21	$331.25
14	DOV08	C04061 6 PC COMBO	48.1	50.0	558	536	545	13	0	2.3	0.0	7.5	$790.25	$98.41	$1450.00	$18.85
16	ICS21	STAB. RED COKE/1230	46.2	35.0	622	822	627	0	195	0.0	23.7	8.0	$231.99	$29.04	$370.00	$0.00
18	FIS82	70086-5261/71/81	36.2	36.0	795	799	791	4	8	0.5	1.0	8.0	$731.48	$42.66	$924.75	$3.70
20	FIS89	70091-0603	46.5	45.0	604	624	527	77	97	12.7	15.5	7.8	$899.52	$44.07	$1706.86	$131.43
21	RAS11	6591-11-1404-4111 W/	37.1	27.0	770	2115	1233	307	882	19.9	41.7	7.9	$431.55	$25.21	$350.00	$107.45
22	GEN07	162D5683P003 WP/663	57.6	55.0	499	1046	1029	0	17	0.0	1.6	8.0	$920.54	$41.82	$894.60	$0.00
15	XDL49	42169 BODY W/LENS	44.9	45.0	393	392	324	69	68	17.6	17.3	4.9	$420.41	$50.93	$1297.55	$89.53

Shift Analyzation

Shift Total Scrap Dollars.........: $2114.77
Shift Average Scrap Percentage....: 12.8%
Shift Scrap Percentage............: 20.5%
Shift Loss Percentage.............: 28.6%
Shift Machine Utilization.........: 67.2%
Shift Productivity................: 71.5%
Average Machine Rate.(Uptime Hrs).: $41.34
Total Machine Hours...............: 123.70
Total Dollar Sales................: $10,221.41
Total Dollars Contribution........: $5,113.26

Total Dollars Scrap For All Shift.. $5,643.55

Project Future
Competency Area 2.0: Mathematics

Competency Number 2.1:	Whole Numbers
Lesson Number 2.1.7:	Use a Calculator to Compute Solutions
Lesson Objective:	Given an exercise, the trainees will correctly complete 35 of 38 problems.
Prerequisite Skill:	The trainee must be able to read directions.
Literacy Skills:	The trainee will demonstrate ability to use electronic technology. The trainee will demonstrate listening skills. The trainee will use critical thinking to estimate whether his/her calculator answers are reasonable.

Presentation:

I. The trainer will introduce the lesson by having calculators for each trainee. Ask the trainees to practice using the calculator by completing the exercise, Happy Birthday. Allow trainees to share their answers.

II. Using the handout, Using Standard Calculator Functions, have trainees put in values and perform the operations as they are read.

Evaluation: Trainees complete the exercise, Calculating Problems.

Extension Activity: The trainees will use the calculator to check the addition in another exercise.

Using Standard Calculator Functions

To use the standard calculator functions, click the following buttons or press the keyboard equivalent.

Button	Function
+	Adds
–	Subtracts
*	Multiplies
/	Divides
+/-	Changes the sign of the displayed number
.	Inserts a decimal point in the displayed number. The period is the standard setting for a decimal separator. Use Control Panel to change the decimal separator.
sqrt	Calculates the square root of the displayed value.
%	Calculates percentages
=	Performs any operation on the previous two numbers. Choose again to repeat the last operation.
1/x	Calculates the reciprocal of the displayed number
Back	Deletes the rightmost digit of the displayed number
C	Clears the current calculation
CE	Clears the displayed number
MC	Clears any value stored in memory
MR	Recalls the value stored in memory. The value remains in memory.
MS	Stores the displayed value in memory
M+	Adds the displayed value to any value already in memory

Calculating Problems

Using the computer Calculator, add the following numbers:

24	36	99	12	33	17
+ 6	+44	+66	+29	+88	+55

79	90	114	8,750	75,849	398,671
77	68	99	9,087	654,987	896,754
44	92	567	923	45,961	598,367
+ 3	+91	+892	+6,261	+371,982	+ 33,829

Subtract the following:

72	68	654	9,982	4,165	2,758
-32	-22	-432	-2,097	- 380	-1,175

2.5	7.89	89,615	908.32	872.88	691,359.02
-1.3	-8.32	-62,738	- 67.22	-917.36	-678,987.95

Multiply the following:

8	99	138	9,839	555	92,563
x 9	x 86	x 88	x 8,965	x 86	x 1,987,037

Divide the following:

375 ÷ 53 =

499 ÷ 77 =

145 ÷ 25 =

24,882 ÷ 36 =

10,842 ÷ 281 =

49 ÷ 9 =

56,982 ÷ 44 =

12,986 ÷ 4,869 =

Project Future
Competency Area 2.0: Mathematics

Competency Number 2.2: Fractions

Lesson Number 2.2.1.: Read Measurements--Understand the Relationship of Fractions to Whole Numbers

Lesson Objective: Given an exercise, the trainees will correctly complete 15 of 20 problems.

Prerequisite Skills: The trainee must be able to read.
The trainee must understand whole numbers.

Literacy Skills: The trainee will be able to read an English measurement ruler.
The trainee will be able to read and interpret common fractions located on a ruler.
The trainee will be able to place fractions in order from the lowest value to the highest value.
The trainee will be able to use a ruler to accurately measure objects.

Presentation:

I. Prior to class, the trainer will purchase a large chocolate chip cookie. The cookie is the whole. The pieces that it will be cut into become the fractions.

II. Trainer introduces the lesson by asking for definitions of a fraction. A fraction is a part of something, a part of a whole. A penny is a small part of a dollar. A dime is a larger part of the dollar, and a quarter is an even larger part of a dollar. An inch is a part of a foot. How would you express each of these as fractions? Using the marker board draw circle graphs to represent each of these and write the fractions beside them.

III. The trainer will cut the large Chocolate Chip Cookie into servings for each member of the class. What is the fraction represented for the whole (12/12 or 7/7)? The number *one* can always be expressed as a fraction. This will be important later when we begin subtracting and reducing with mixed number fractions. Ask the trainees what fraction represents their piece of the cookie? Write it on the board. Explain:

> Numerator tells how many parts you are talking about
> Denominator tells how many parts are in the whole

IV. The trainees will complete the exercise, Parts of a Whole.

V. The trainer will lead the trainees to understand the comparative value of fractions. Which is larger 1/2 or 1/4 or 1/3?

VI. The trainer will give each trainee a ruler. Using the ruler, the trainer will explain that the ruler is divided into fractional parts. The trainees will use the rulers to measure several small objects that the trainer has brought to class. The trainees will record the measurements. Trainees will order the recorded measurement from smallest to largest. Trainees will share their answers with the class. As the answers are given, the trainer will write them on the board. Once all answers are given, the trainer will define the terms: *Proper fraction* (the top number is less than the bottom number), *Improper fraction* (the top number is equal to or larger than the bottom number), *Mixed number* (a whole number is written next to a proper fraction representing one or more wholes and a portion of another).

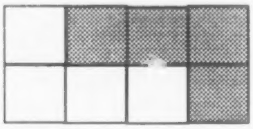
VII. The trainer will demonstrate three or four problems in reducing fractions to lowest terms on the board. The trainer will emphasize that when you reduce a fraction, the value does not change. A reduced fraction is equal to the original fraction. The trainer will show the inverse--that you can also raise a fraction to higher terms. Show changing improper fractions to whole or mixed numbers.

Evaluation: The trainees will complete the exercise, Understanding Fractions. (A part of this exercise involves the trainees' use of the rulers to measure parts the trainer has gathered before the training session.)

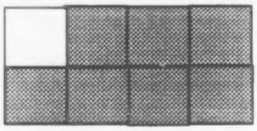
Extension Activity: The trainee will use standard English measuring cups to measure the ingredients for a favorite recipe. The trainee will bring the product and the written recipe to class to be placed in a booklet of favorite class recipes.

Parts of a Whole

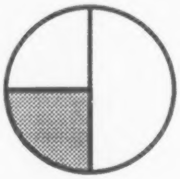
Write the fraction that represents the shaded area of the figure below.



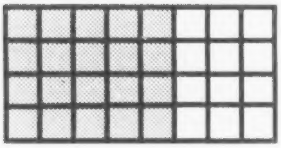
1. ____________



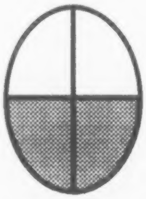
2. ____________



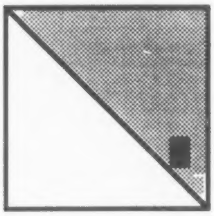
3. ____________



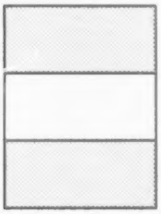
4. ____________



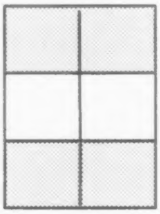
5. ____________



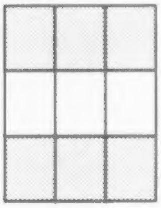
6. ____________



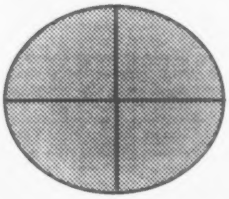
7. ____________



8. ____________



9. ____________



10. ____________

11-15. Label the numerators and denominators in the following fractions by writing *N* by the numerators and *D* by the denominators.

$\frac{1}{5}$ $\frac{5}{6}$ $\frac{7}{12}$ $\frac{9}{15}$ $\frac{3}{4}$

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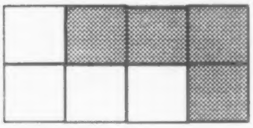
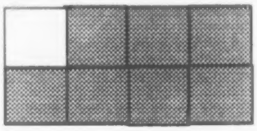
Parts of a Whole

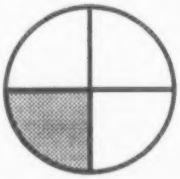
Write the fraction that represents the shaded area of the figure below.



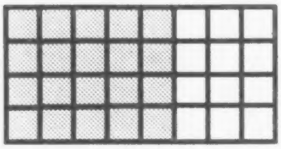
1. $\frac{4}{8}$



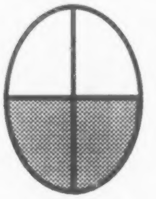
2. $\frac{7}{8}$



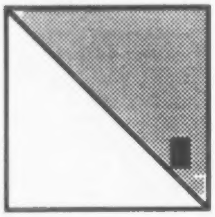
3. $\frac{1}{4}$



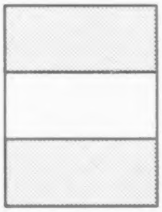
4. $\frac{20}{32}$



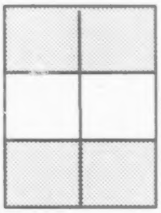
5. $\frac{2}{4}$



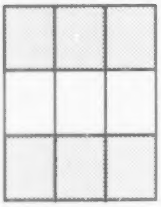
6. $\frac{1}{2}$



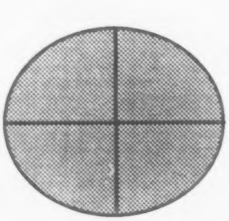
7. $\frac{2}{3}$



8. $\frac{4}{6}$



9. $\frac{6}{9}$



10. $\frac{4}{4}$

11-15. Label the numerators and denominators in the following fractions by writing *N* by the numerators and *D* by the denominators.

$\frac{1}{5}\ \begin{matrix}N\\D\end{matrix}\qquad \frac{5}{6}\ \begin{matrix}N\\D\end{matrix}\qquad \frac{7}{12}\ \begin{matrix}N\\D\end{matrix}\qquad \frac{9}{15}\ \begin{matrix}N\\D\end{matrix}\qquad \frac{3}{4}\ \begin{matrix}N\\D\end{matrix}$

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Reading Measurements/ Understanding Fractions

A fraction is a part of something whole. A penny is a fraction of a dollar. It si one of the 100 equal parts of a dollar or 1/100 (one hundredth) of a dollar. An isnch is a fraction of a foot. It is one of the 12 equal parts of a foot or 1/12 (one twelfth) of a foot.

Fractions are written as two numbers. The numbers are separated by a slash or horizontal line. Examples of fractions are shown below.

$\frac{1}{4}$ ¼ $\frac{10}{17}$ 10/17

The two numbers in a fraction have names:

$\frac{3}{4}$	The numerator (top number) tells how many parts you have The Denominator (bottom number) tells how many parts are in the whole

> The fraction ¾ tells you what part of The circle at the right is shaded. Three parts are shaded. The whole figure is divided into four equal parts.

Notice that the slash or horizontal dividing line looks like a division sign ÷. It means the same thing. So, you should always think of a fraction as a division problem. You could read 3/4 as "three fourths" or "three divided by four".

For example, this rule divides each inch into two equal parts.

A width equal to one of the smaller marks on the rule is written as 1/2.

You would read this fraction as "one half." The denominator is 2 because each whole inch is divided into two parts. The numerator is 1 because we are considering or talking about one part of the inch.

Most standard rules are scaled to measure in halves (1/2), quarters (1/4), eighths (1/8), and sixteenths (1/16).

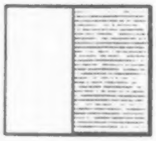
The part below has a width of 9/16". It lines up with one of the smallest marks on the rule. Each inch on the rule is divided into 16 parts. So, the denominator is 16. Since the width spans inine of these marks, the numerator is 9. The fraction 9/16 is read as "nine sixteenths."

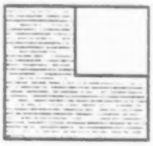
The smallest marks on most rules or tape measures divide inches into 16 or 32 parts. These are called sixteenths (1/16) or thirty-seconds (1/32).

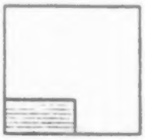
Express the length of the part below as a fraction. Circle the numerator.

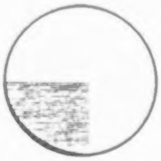
Practice

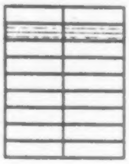
Write fractions that represent the part of each figure that is shaded.


1.__________


2. __________


3. __________


4. __________


5.__________

Write fractions for each of the problems described below.

____ 6 There are 2,000 pounds in a ton. A gaylord weighs 1000 pounds. A Gaylord is what fraction of a ton?

____ 7 There are 4 quarts in a gallon. Three quarts is what fraction of a gallon?

____ 8 Seven months is what fraction of a year?

____ 9 A yard contains 3 feet. One foot is what fraction of a yard?

____ 10 A yard contains 36 inches. Twenty-three inches is what fractional part of a yard?

____ 11 There are 100 centimeters in a meter. Sixty-three centimeters is what fraction of a meter?

____ 12 There are 2 pints in a quart and 4 quarts in a gallon. What fractional part of a gallon is 2 pints? (Express your answer in pints.)

____ 13 A foot contains 12 inches. Seven inches is what fraction of a foot?

____ 14 Joe makes $150 a week. He has already spent $113. What fraction of his Week's pay has he spent?

____ 15 Forty-seven cents is what fractional part of a dollar?

Use the measuring tools provided to answer the following questions:

16. What is the width of part number 1?

17. How long is part number 3?

18. What are the exterior dimensions on part number 4?

19. How small is the diameter of the circular opening on the front of part number 5?

20. What are the interior dimensions on part number 2?

Project Future
Competency Area 2.0: Mathematics

Competency Number 2.2: Fractions

Lesson Number 2.2.2: Compute Fractions Using a Calculator

Lesson Objective: Given an exercise, the trainees will correctly complete 25 of 30 problems.

Prerequisite Skills:

The trainee must be able to read and understand whole numbers.
The trainee must be able to compute whole-number problems using a calculator.
The trainee must be able to read a Quality Control Inspection Instruction Sheet.

Literacy Skills:

The trainee will be able to use a standard calculator to compute fractions.
The trainee will be able to understand the relationship of fractions to decimals.
The trainee will be able to convert fractions to decimals.
The trainee will be able to place fractions in order from the lowest value to the highest value.
The trainee will be able to read simple instructions from a blueprint of a plastic part.

Presentation:

I. The trainer will introduce the session by giving trainees a copy of a part blueprint. Why are blueprints used? In fractions, what are the dimensions of the part between points 4 and 5? What are the dimensions between the double arrows in points 2 and 3? Trainees record answers on a scrap sheet of paper. Do the trainees see the fraction for the dimension at 2 and 3 on the matching Instruction Inspection Sheet? (Answer: No).

II. Trainer will instruct the trainees one step at a time in using the calculator to convert the above fractions to decimals. Ask the trainees if they now see the decimal equivalent of the fractions on the Inspection Instruction Sheet. (Answer: Yes. The decimal is in number 4 and is listed as a critical dimension. Discuss the meaning of the word *critical*.)

Evaluation: The trainees will complete the exercise, Using a Calculator to Convert Fractions to Decimals. Trainees will self score the exercise using a key.

Extension Activity: The trainee will use a home-improvement advertisement to figure the number of boards needed for a deck that measures 9 1/2' X 10 3/4'. The trainees will convert all fractions to decimals. The trainee will use mixed operations to figure the cost of the lumber.

Using a Calculator
to Convert Fractions to Decimals

Steps to Use

1. Turn on the calculator and hit the clear key. CE/C
2. Enter the numerator (the top number).
3. Press the divided by key. ÷
4. Enter the denominator (the bottom number).
5. Press the equals key. =
6. You will see a decimal in the viewing window. That is the answer. It is the decimal equivalent of the fraction.

Use your calculator to convert the following fractions to decimals.

5/6 __________ 1/3 __________ 18/23 __________ 1/2 __________

34/35 __________ 41/65 __________ 1/1 __________ 3/6 __________

8/9 __________ 7/9 __________ 3/12 __________ 1/4 __________

5/16 __________ 7/49 __________ 3/21 __________ 25/27 __________

7/39 __________ 34/17 __________ 2/1 __________ 245/689 __________

5/10 __________ 8/16 __________ 50/100 __________ 500/1000 __________

9/10 __________ 4/7 __________ 19/45 __________ 1/6 __________

If one-sixth of the 180 parts you produce are bad, what decimal represents the number of bad parts?

If you have 3/5 of a gallon of water, what decimal part of a gallon do you have?

Using a Calculator to Convert Fractions to Decimals

Steps to Use

1. Turn on the calculator and hit the clear key. CE/C
2. Enter the numerator (the top number).
3. Press the divided by key. ÷
4. Enter the denominator (the bottom number).
5. Press the equal key. =
6. You will see a decimal in the viewing window. That is the answer. It is the decimal equivalent of the fraction.

Use your calculator to convert the following fractions to decimals.

5/6	.833	1/3	.333...	18/23	.7826	1/2	.50
34/35	.971	41/65	.630	1/1	1.0	3/6	.50
8/9	.888...	7/9	.777...	3/12	.25	1/4	.25
5/16	.313	7/49	.143	3/21	.143	25/27	.926
7/39	.179	34/17	2.0	2/1	2.0	245/689	.356
5/10	.50	8/16	.50	50/100	.50	500/1000	.50
9/10	.9	4/7	.571	19/45	.422...	1/6	.166...

If one-sixth of the 180 parts you produce are bad, what decimal represents the number of bad parts? .166...

If you have 3/5 of a gallon of water, what decimal part of a gallon do you have? .60

Project Future
Competency Area 2.0: Mathematics

Competency Number 2.3: Decimals

Lesson Number 2.3.1: Compare Average Machine Cycles to Standard Machine Cycles, Read and Compare Decimals

Lesson Objective: Given an exercise with production problems concerning average and standard cycles, the trainee will correctly complete 15 of 20 problems.

Prerequisite Skills: The trainee must be able to read and understand whole numbers.
The trainee must understand place value concepts of whole numbers.

Literacy Skills:

The trainee will be able to order decimals from the lowest to the largest values.
The trainee will understand the place value of decimals.
The trainee will be able to understand the relationship of decimals to whole numbers and to fractions.
The trainee will be able to read a Production Report.

Presentation:

I. The trainer will introduce the lesson by giving each trainee a coin. Ask trainees to place the coins in line from smallest value to largest. Notice and remark how easily and quickly the employees complete the exercise.

II. Using the board, the trainer will explain the place values of decimals. Trainees will complete the exercise, Placing a Value on Numbers Less Than One.

III. Trainer will complete the first two problems from the table, Comparing Common Fractions and Decimals. The trainees will complete the table.

Evaluation: The trainees will complete the exercise, Average vs. Standard Cycles. Trainees will self check the exercise.

Extension Activity: The trainee will calculate the number of people they could invite to a birthday party if the cost per person amounts to $4.25 and they have $250.50 to spend. Compare this number with the number of persons if the cost is 4 1/4 dollars and they have 250 1/2 dollars to spend.

Placing A Value On Numbers Less Than One

The placement of the decimal in a number is important. Numbers that are to the left of the decimal (such as 21.) are whole numbers. Any numbers located to the right of the decimal are fractional parts of one whole number. For example: .5 is 5/10, which when reduced is 1/2. 1/2 is less that one. The chart below indicates the place value of decimal numbers.

millions	hundred thousands	ten thousands	thousands	hundreds	tens	ones		tenths	hundredths	thousandths	hundred thousandths	millionths
1,	6	5	9,	1	2	3	.	1	2	1	9	5

This number is read as one million six hundred fifty nine thousand one hundred twenty three **and** twelve thousand one hundred ninety five millionths.

Notice that the place values begin with a one on the whole number side. The decimal side begins with tenths.

Practice reading the following numbers.

.15 .25 .175 .588 12.35 125.987

Hint: the first number is not "point 15." It is read as 15 hundredths.

Answer the following questions about the number below.

7125. 89643

What digit is in the tenths place?	What is in the hundreds place?
What digit is in the thousandths place?	What digit is in the ten thousandths place?
What digit is in the ones place?	What digit is in the hundredths place?

Place the following decimal values in order from lowest to highest.

.12 .125 .25 .65 .1 1.0 .87 .567 .237 12.5 .877 1.25

lowest
highest

Fractions and Decimals
Table of Equivalents

Fraction	Decimal
1/4	.25
1/2	
3/4	
1/3	
2/3	
1/5	
3/5	
1/10	
3/10	
9/10	
1/20	

Fractions and Decimals
Table of Equivalents

Fraction	Decimal
1/4	.25
1/2	*.50*
3/4	*.75*
1/3	*.33*
2/3	*.66*
1/5	*.20*
3/5	*.60*
1/10	*.10*
3/10	*.30*
9/10	*.90*
1/20	*.05*

Average vs. Standard Machine Cycles

In order for the company to profit from a job, it is extremely important for the manufacturing team to keep the machine's average cycle at least equal to the standard cycle or faster. A cycle is the time it takes the plastic to enter the machine and be pushed out in the form of a part. The standard cycle is the cycle at which the job was quoted. The average cycle is the average of all the cycles the machine has made during a period of time--usually a shift.

If the machine is running quality parts at a speed faster than the quoted cycle or standard cycle, the company makes a little extra money. If the machine is running slower than the standard cycle, the company loses money.

Use what you have learned about decimals to complete the following problems.

Circle the fastest time of the cycles in each of the groups listed below (the smaller the number, the faster the cycle). In other words, circle the smallest decimal value.

1. 30.0 48.0 48.6 28.2
2. 29.03 29.6 29.09 30.0
3. 49.8 5.04 .504 .102
4. 55.0 .555 .551 .005
5. 78.1 78.9 78.99 78.45

Using the Production Report given, answer the following questions.

6. On machine No. 1, is the standard cycle larger or smaller than the average cycle? Is the company making money?
7. On part code FIS79, which is larger, the average cycle or the standard cycle?
8. On the clip, is the average cycle larger than the standard cycle?
9. Which has the longest standard cycle, machine number 15 or machine number 14?
10. Which has the shortest standard cycle, machine number 10 or machine number 20?
11. Which has the longest average cycle, machine number 11 or machine number 13?

12. Which machine had the longest number of hours up?

13. Which machine contributed the most money to the shift?

14. Which machine had the highest percent scrap?

15. Which machine had the largest percent loss?

16. Which machine had the smallest percent loss?

17. Which machine had the shortest standard cycle?

18. Which machine had the longest standard cycle?

19. On part code C04061, which is larger, the average cycle or the standard cycle?

20. On WES11, which is faster, the standard cycle or the average cycle?

```
                              PRODUCTION REPORT FOR 08 MAY-95 SHIFT #

MACH¦ PART ¦ DESCRIPTION           ¦ AVG ¦ STD ¦ TOTAL ¦ OPTM ¦  ACT ¦SCRAP¦TOTAL¦  %  ¦  %  ¦ HRS ¦ DOLLARS ¦ $/       ¦ SELLING ¦ SCRAP
 NO.¦ CODE ¦                       ¦ CYC ¦ CYC ¦ SHOTS ¦ PROD ¦ PROD ¦PARTS¦ LOSS¦SCRAP¦ LOSS¦  UP ¦  SALES  ¦ HR       ¦  PRICE  ¦DOLLARS
----|------|-----------------------|-----|-----|-------|------|------|-----|-----|-----|-----|-----|---------|----------|---------|----------
  1 ¦RAS04 ¦6591-11-1104-4115 A/  ¦ 28.0¦ 30.0¦    916¦   854¦   771¦  145¦   83¦ 15.8¦  9.8¦  7.1¦  $353.80¦  $40.68¦  $458.88¦   $66.54
  2 ¦FIS79 ¦70077-9663YLPEG/3837  ¦ 51.7¦ 47.0¦    544¦   598¦   476¦   68¦  122¦ 12.5¦ 20.4¦  7.8¦  $877.82¦  $34.72¦ $1844.15¦  $125.40
  3 ¦HUD03 ¦R5942 1 1/4 BLACK SI  ¦ 48.7¦ 45.0¦    468¦  1013¦   940¦    0¦   73¦  0.0¦  7.2¦  6.3¦  $734.85¦  $55.78¦  $781.75¦    $0.00
  4 ¦FIS87 ¦70077-9423 ASSY TABL  ¦ 53.1¦ 43.0¦    539¦   666¦   505¦   34¦  161¦  6.3¦ 24.1¦  8.0¦ $1127.12¦  $38.78¦ $2231.92¦   $75.89
  5 ¦FISA3 ¦70079-1531 MT BASE    ¦ 48.6¦ 45.0¦    375¦   810¦   655¦   95¦  155¦ 12.7¦ 19.1¦  5.1¦  $828.38¦  $38.54¦ $1264.70¦  $120.15
  6 ¦GEN02 ¦162D3835P004 COV HIN  ¦ 32.7¦ 20.0¦    836¦  5465¦  3335¦    9¦ 2130¦  0.3¦ 39.0¦  7.6¦  $401.50¦  $24.52¦  $120.39¦    $1.08
  9 ¦HAM01 ¦CLIP                  ¦ 29.5¦ 28.0¦    918¦  3867¦  3400¦  272¦  467¦  7.4¦ 12.1¦  7.5¦  $179.01¦  $19.89¦   $52.65¦   $14.32
 10 ¦WES27 ¦EN10142 BASE          ¦102.1¦100.0¦     43¦    44¦    33¦   10¦   11¦ 23.3¦ 24.9¦  1.2¦   $96.50¦  $42.21¦ $2924.20¦   $29.24
 11 ¦ATG05 ¦BELT LINK HUMP/AQUA   ¦ 52.9¦ 45.0¦    336¦  1581¦   840¦  504¦  741¦ 37.5¦ 46.9¦  4.9¦  $369.63¦  $55.84¦  $440.04¦  $221.78
 13 ¦FIS31 ¦70082-7418 USA BLUE   ¦ 28.3¦ 35.0¦    993¦  3209¦  2510¦ 1462¦  699¦ 36.8¦ 21.8¦  7.8¦  $545.20¦  $33.16¦  $217.21¦  $317.56
 14 ¦DUV08 ¦CD4061 6 PC COMBO     ¦ 48.0¦ 50.0¦    569¦   546¦   531¦   38¦   15¦  6.7¦  2.7¦  7.6¦  $769.95¦  $94.24¦ $1450.00¦   $55.10
 15 ¦KOL49 ¦42169 BODY W/LENS     ¦ 50.4¦ 45.0¦    311¦   348¦   297¦   14¦   51¦  4.5¦ 14.7¦  4.4¦  $385.37¦  $52.59¦ $1297.55¦   $18.17
 16 ¦ICS21 ¦STAB. RED COKE/1230   ¦ 46.2¦ 35.0¦    623¦   822¦   826¦    0¦    0¦  0.0¦  0.0¦  8.0¦  $305.62¦  $38.25¦  $370.00¦    $0.00
 17 ¦FISA4 ¦SEAT 2331/PED 2493    ¦ 37.0¦ 30.0¦    747¦  1841¦  1202¦  292¦  639¦ 19.5¦ 34.7¦  7.7¦  $596.76¦  $14.47¦  $496.47¦  $144.97
 18 ¦FIS82 ¦70086-5261/71/81      ¦ 36.1¦ 36.0¦    797¦   799¦   789¦    8¦   10¦  1.0¦  1.3¦  8.0¦  $729.63¦  $42.55¦  $924.75¦    $7.40
 20 ¦FIS89 ¦70091-0603            ¦ 48.6¦ 45.0¦    590¦   637¦   564¦   26¦   73¦  4.4¦ 11.4¦  8.0¦  $962.67¦  $46.21¦ $1706.86¦   $44.38
 71 ¦RAS11 ¦6591-11-1404-4111 W/  ¦ 36.4¦ 27.0¦    308¦   829¦   466¦  150¦  363¦ 21.4¦ 43.8¦  3.1¦  $163.10¦  $24.30¦  $350.00¦   $52.50
 22 ¦GEN07 ¦162D5683P003 WP/663   ¦ 55.4¦ 55.0¦    446¦   898¦   796¦   96¦  102¦ 10.8¦ 11.4¦  6.9¦  $712.10¦  $37.68¦  $894.60¦   $85.88
 23 ¦ICS03 ¦STAB. RED COKE/1228   ¦ 43.1¦ 35.0¦     61¦    75¦   141¦    0¦    0¦  0.0¦  0.0¦  0.7¦   $52.17¦  $71.47¦  $370.00¦    $0.00
 10 ¦WES11 ¦EN10098 LG. BASE      ¦125.2¦ 91.0¦     23¦    32¦    23¦    0¦    9¦  0.0¦ 27.3¦  0.8¦   $77.05¦  $42.43¦ $3350.00¦    $0.00


Shift Analyzation

Shift Total Scrap Dollars.........:  $1380.35
Shift Average Scrap Percentage....: 11.2%
Shift Scrap Percentage............: 14.4%
Shift Loss Percentage.............: 23.7%
Shift Machine Utilization.........: 64.3%
Shift Productivity................: 76.6%
Average Machine Rate.(Uptime Hrs).:  $40.77
Total Machine Hours...............: 118.38
Total Dollar Sales................: $10,268.21
Total Dollars Contribution........:  $4,826.76
```

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Project Future
Competency Area 2.0: Mathematics

Competency Number 2.3: Decimals

Lesson Number 2.3.2: Prepare Shift Analysis Reports, Compare Decimal Values, Add and Subtract Decimals

Lesson Objective: Given a Production Report, the trainee will be able to correctly prepare a Shift Analysis Report.

Prerequisite Skills:
The trainee must be able to read and understand whole numbers.
The trainee must be able to add and subtract whole numbers.
The trainee must be able to read a Production Report.

Literacy Skills:
The trainee will be able to add and subtract decimals.
The trainee will be able to understand the relationship of parts to a whole.
The trainee will be able to read a Production Report and define the terms on a Shift Analysis Report.
The trainee will demonstrate group skills by reaching consensus on a procedure to follow.
The trainee will follow and give oral directions.

Presentation:

I. The trainer will begin the lesson by asking the trainees to place whatever change they have in their pockets on the table. The trainee will tell the group the value of his/her pocket change. The trainer should ask one of the trainees, "How did you know how much money you had? How did you total the coins?" As the trainee gives an explanation, the trainer should write it on the board. Ask the other trainees to confirm, add to, or change the information. The trainer will lead the trainees to tell him/her how to write the decimal values of coins. The trainer will then demonstrate the addition of three coins' values by using the information the trainees have had written on the board. The trainer should lead the trainees to discover any incorrect information and make the correction as a group. The trainees will add the values of the coins from their pockets. The trainees will then subtract three coins from their total. The trainees will then explain the process for subtracting decimals. The trainees arrange their coins in order from smallest to largest, left to right.

II. The trainees review reading a Production Report by finding information requested by the trainer:

- What was the average cycle on machine number 20?
- What was the optimum production of part code WES11?
- What was the actual production of 6591-11-11-4-4115 A/?
- What were the number of hours up on machine number 16?
- What were the scrap dollars for ICS03?
- What was the percentage loss for 42169 body w/lens?

The trainer should ask the trainees to define each of the categories. This information is a review of the information contained in the language lesson.

III. The trainees complete the exercise, Understanding Decimals, Addition, and Subtraction. Trainees will score the exercise by comparing answers with a partner. When trainees disagree on an answer, they are to recheck their answers together to come up with an answer on which they can agree. The trainer will explain that this process of working together to reach an answer on which all parties can agree is called consensus building. This is much the same process that the group used earlier in the class period when they decided upon the directions for adding and subtracting fractions written on the board.

Evaluation: Using the Production Report, the trainees complete a Shift Analysis for the shift represented on the Production Report.

Extension Activity: The trainees will complete a check register for practice.

Understanding Decimals
Addition and Subtraction

Add the following decimals. Remember that the most important thing in adding and subtracting decimals is to keep the decimal points in a straight line.

1.	2.15	5.56	84.58	55.656	464.56	.8966
	1.23	1.56	95.43	23.952	359.99	.98

2.	46.564	654.654	5465.4	6545.64	545.64	72.83
	48.878	899.889	4556.6	89.88	754.78	41.29
	26.693	892.324	4827.5	455.23	493.369	38.69

Subtract the following:

3.	413.53	6.645	768.564	65.461	212.32	22.34
	56.45	3.687	548.945	64.564	25.64	7.89

4.	469.87	.897	46.8478	9.46514	510.3	22.16
	254.15	.631	45.0981	6.98981	395.5	19.7

Solve the following production problems that contain both addition and subtraction problems. Use the production report provided to answer the following questions.

5. What is the difference in the standard cycle and the average cycle of machine number1?

6. What is the difference between the scrap % of machine number 5 and the scrap % of machine 9?

7. What is the difference in the Dollars Sales for GEN07 and FIS87?

8. How much more is the selling price than the Dollars in Sales for KDL49?

9. How many more hours was machine number 1 up than machine number 11?

10. What is the difference in scrap between machine number 21 and machine number 4?

Shift Analysis Report

Shift Total Scrap Dollars	
Shift Average Scrap Percentage	
Shift Scrap Percentage	
Shift Loss Percentage	
Shift Machine Utilization	
Shift Productivity	
Average Machine Rate (Uptime Hrs.)	
Total Machine Hours	
Total Dollar Sales	
Total Dollars Contribution	

PRODUCTION REPORT FOR 08-MAY-95 SHIFT #1

MACH NO.	PART CODE	DESCRIPTION	AVG CYC	STD CYC	TOTAL SHOTS	OPTM PROD	ACT PROD	SCRAP PARTS	TOTAL LOSS	% SCRAP	% LOSS	HRS UP	DOLLARS SALES	$/ HR	SELLING PRICE	SCRAP DOLLARS
1	RAS04	6591-11-1104-4115 A/	28.0	30.0	916	854	771	145	83	15.8	9.8	7.1	$353.80	$40.68	$450.88	$66.54
2	FIS79	70077-9663YLPEG/3837	51.7	47.0	544	598	476	68	122	12.5	20.4	7.8	$877.82	$34.72	$1844.15	$125.40
3	HUD03	R5942 1 1/4 BLACK ST	48.7	45.0	468	1013	940	0	73	0.0	7.2	6.3	$734.85	$55.78	$781.75	$0.00
4	FIS87	70077-9423 ASSY TABL	53.1	43.0	539	666	505	34	161	6.3	24.1	8.0	$1127.12	$38.78	$2231.92	$75.89
5	FISA3	70079-1531 MT BASE	48.6	45.0	375	810	655	95	155	12.7	19.1	5.1	$828.38	$38.54	$1264.70	$120.15
6	GEN02	162D3835P004 COV HIN	32.7	20.0	836	5465	3335	9	2130	0.3	39.0	7.6	$401.50	$24.52	$120.39	$1.08
9	HAM01	CLIP	29.5	28.0	918	3867	3400	272	467	7.4	12.1	7.5	$179.01	$19.89	$52.65	$14.32
10	WES27	EN10142 BASE	102.1	100.0	43	44	33	10	11	23.3	24.9	1.2	$96.50	$42.21	$2924.20	$29.24
11	ATG05	BELT LINK HUMP/AQUA	52.9	45.0	336	1581	840	504	741	37.5	46.9	4.9	$369.63	$55.84	$440.04	$221.78
13	FIS31	70082-7418 USA BLUE	28.3	35.0	993	3209	2510	1462	699	36.8	21.8	7.8	$545.20	$33.16	$217.21	$317.56
14	DUV08	CD4061 6 PC COMBO	48.0	50.0	569	546	531	38	15	6.7	2.7	7.6	$769.95	$94.24	$1450.00	$55.10
15	KOL49	42169 BODY W/LENS	50.4	45.0	311	348	297	14	51	4.5	14.7	4.4	$385.37	$52.59	$1297.55	$18.17
16	ICS21	STAB. RED COKE/1230	46.2	35.0	623	822	826	0	0	0.0	0.0	8.0	$305.62	$38.25	$370.00	$0.00
17	FISA4	SEAT 2331/PED 2493	37.0	30.0	747	1841	1202	292	639	19.5	34.7	7.7	$596.76	$14.47	$496.47	$144.97
18	FIS82	70086-5261/71/8	36.1	36.0	797	799	789	8	10	1.0	1.3	8.0	$729.63	$42.55	$924.75	$7.40
20	FIS89	70091-0603	48.6	45.0	590	637	564	26	73	4.4	11.4	8.0	$962.67	$46.21	$1706.86	$44.38
21	RAS11	6591-11-1404-4111 W/	36.4	27.0	398	829	466	150	363	24.4	43.8	3.1	$163.10	$24.30	$350.00	$52.50
22	GEN07	162D5683P003 WP/663	55.4	55.0	446	898	796	96	102	10.8	11.4	6.9	$712.10	$37.68	$894.60	$85.88
23	ICS03	STAB. RED COKE/1228	43.1	35.0	61	75	141	0	0	0.0	0.0	0.7	$52.17	$71.47	$370.00	$0.00
10	WES11	EN10098 LG. BASE	125.2	91.0	23	32	23	0	9	0.0	27.3	0.8	$77.05	$42.43	$3350.00	$0.00

Shift Analyzation

Shift Total Scrap Dollars..........:	$1380.35
Shift Average Scrap Percentage....:	11.2%
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Average Machine Rate.(Uptime Hrs).:	$40.77
Total Machine Hours...............:	118.38
Total Dollar Sales................:	$10,268.21
Total Dollars Contribution........:	$4,826.76

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Project Future
Competency Area 2.0: Mathematics

Competency Number 2.3: Decimals

Lesson Number 2.3.3: Compute Weekly Wages, Multiply Using Decimals

Lesson Objective: Given a wage rate table, a tax table, and a table of deductions for insurance premiums, the trainee will be able to compute the amount of his/her check.

Prerequisite Skills: The trainee must be able to read and understand whole numbers.
The trainee must be able to add, subtract, and multiply whole numbers.

Literacy Skills:

The trainee will multiply decimals.
The trainee will use multiple operations to achieve the answer to a problem.
The trainee will locate information in a table.

Presentation:

I. The trainer will ask the trainees whether $386.00 is the correct amount of pay for Suzy Q. Trainee for one week. How do they know? How much should she be paid if she worked her regular 40 hours with no overtime? The trainer will ask trainees why it is important that they learn to correctly compute their pay.

II. The trainer will explain that trainees are going to compute the correct amount of their checks for varying hours by applying their knowledge of the multiplication of decimals. Using the wage-rate table and the handout, Tips for Reading Tables, the trainer will briefly review how to read tables. The trainees will try their luck at locating information asked for by the trainer, on the tax table.

Evaluation: Using the tax and wage-rate tables, the trainees will complete the exercise, How Much Did I Earn? Trainer will score the exercise.

Extension Activity: The trainees will compute the cost of lumber for a home-improvement project of their choice, such as a deck.

Tips for Reading Tables

Some information can be found and understood more quickly if it appears in a chart or table. It is often easier to see how one set of information changes or depends on another. A table lists information. It makes comparisons easier.

There are some easy ways to locate just the information you need in a table.

Decide what information you need.

Read the title of the table or chart. It indicates what information is included in the table.

Look at the way the chart is set up. Tables are organized in columns and rows. Columns go up and down. Rows go across. These columns have labels that indicate what information will be found in them. The Production Report is a type of table.

Read any legends or other information located on the page away from the table.

Read the row across to the where the column intersects to find the information you need.

EXAMPLE:

Engineering Resins

Amphorous Plastics	Typical Melt (°F)	Melt Temp. (°F)	Mold Temp. (°F)	Screw Speed (RPM)	Back Pressure (PSI)	Mold Shrinkage (in./in.)	Drying Required
Acrylic	425-500	525	150-200	50-100	50	.004-.007	Yes
ABS	400-500	525	100-200	50-100	75-125	.005-.007	Yes
PPO	425-525	600	150-225	25-75	50	.005-.006	Usually
Polycarbonate	525-600	600	175-225	25-50	50	.005-.007	Yes

Payroll Deductions

Often we do not take time to study our payroll stub because we are not sure what all those deductions are. Let's take time to go over all the deductions and determine how they are figured. Knowing how much will come out of our check will help us to budget our money, too.

LOOK AT YOUR PAYCHECK STUB.

This spreadsheet shows the **usual** weekly deductions. **You** might also have **union dues, insurance payments** or **other deductions** that others do not have. Study your actual paycheck stub to see what your deductions are. You will notice that Futura employees pay a Jeffersontown tax.

1. Let's double check the figures on the stub. Use the percent box from last week's lesson to figure your **Social Security tax.**

   a. **x -- 6.2%**
   $365 -- 100

   b. $365 times 6.2 = $2263

   c. 100x)2263

   d. Your SS tax will be $22.63 if you earned $365.

2. Now that you see how to do this, figure your **Medicare tax** in the same way.

3. You see that the Jeffersontown tax is 1%. What is an easy way to figure that?

4. You see that your packet shows a chart for **Kentucky Withholding** and a chart for **Federal Withholding**. This will vary depending upon your marital status and the number of children.

   (Note: When we did step 4 in class, we discovered that the two withholding taxes are figured on the projected yearly average; thus, the payroll stub figures are slightly different from the charts.

5. Enter all of your deductions, including insurance and union dues, on the spreadsheet. Total the deductions and deduct from your gross pay. This gives your net pay.

6. You might want to use the spreadsheet form to keep a record of your deductions for the next pay quarter.

How Much Did I Earn?

Check to make sure the following information is recorded correctly:

- Your name
- Social security number
- Marital status (for tax purposes)
- Exemptions (the number you are claiming)

Under earnings (gross pay), check the following:

- Regular pay rate and number of hours
- Overtime rate and number of hours
- Holiday rate and hours
- Other deductions not included in benefits, such as tuition

Under deductions, check the following:

- Statutory deductions – These are the deductions required by law to be taken out. These are usually taxes.
- Voluntary deductions – These are those items you choose to participate in, such as unions and stock plans.

Net Pay – This must match the amount on your check. This is the amount you will receive after all your deductions have been taken out.

Under Other Benefits, check to be sure that the correct amount has been taken out for each of your benefits. Remember a $1.00 per week deduction ends up being $52 per year.

Always check any notes on the statement.

Check your Check:

- Made out to you?
- Correct amount?
- Signed by company official??

Decimals are a type of fraction you work with every day. Examples: 4.65, $5.25. They stand for dollars and cents, and the point (or period) separates the dollars from the change. The cents are always written to the right of the decimal point. Have you ever thought about why? (Give time for several students to answer.) Since there are 100 cents in a dollar, cents are 100ths of a dollar. 75 pennies is 75/100 of a dollar or .75 (pronounced hundredths) of a dollar. Show other *cents* examples.

In our money system, decimals only go up to hundredths; however, decimals can go from tenths to millionths when they are used for other purposes, for example, exact measurements or long budgetary calculations in large business accounting. Where are exact measurements used in plastics? (Answer: In measuring, using the scales and calipers). Quality Control uses them daily.

Decimals are arranged by 10's only.

Decimals can be changed into fractions. This is done by placing the number that is located behind the decimal point over the number that corresponds to the number of places used to the right of the decimal point. Saying the decimal aloud can help determine the correct place value.

For example: .25 (read as 25 h8undredths) – 25/100.

Fractions can be changed into decimals. To change a fraction to a decimal, divide the bottom number into the top number. Ass a decimal point and zeros to the top number. Usually, the zeros are enough. Remember: You must bring the decimal point up into the answer.

Estimation Skills – When comparing several decimals, sometimes it is difficult to tell which decimal is larger. A simple trick is to give each decimal you are comparing the same number of places by adding zeros to the right of the numbers. For example: which is larger -- .06, .3, or .07? Add the zeros - .06, .30, .07. Which is larger, 6 hundredths, 30 hundredths, or 7 hundredths? Small group practice: pass out groups of note cards with decimals on them.

Earnings Statement

FUTURA PLASTICS AND ENGR., INC.

1920 WATTERSON TRAIL LOUISVILLE, KY 40299

Period ending: 00/00/00
Pay date: 00/00/00

Social Security Number: 999-99-9999
Taxable Marital Status: Married
Exemptions/Allowances:
Federal: 3,$25 Additional Tax
State: 2
Local: 2

JANE HARPER
101 MAIN STREET
ANYTOWN, USA 12345

Earnings	rate	hours	this period	year to date
Regular	10.00	32.00	320.00	16,640.00
Overtime	15.00	1.00	15.00	780.00
Holiday	10.00	8.00	80.00	4,160.00
Tuition			37.43 *	1,946.80
Gross Pay			$ 452.43	23,526.80

Deductions	this period	year to date
Statutory		
Federal Income Tax	- 45.22	2,351.44
Social Security Tax	- 29.83	1,551.67
Medicare Tax	- 6.98	362.89
NY State Income Tax	- 17.37	903.24
NYC Income Tax	- 8.23	427.96
NY SUI/SDI Tax	- 0.60	31.20
Voluntary		
Union Dues	- 5.00	100.00
401(K)	- 28.85 *	1500.20
Stock Plan	- 15.00	150.00
Life Insurance	- 5.00	50.00
Loan	- 30.00	150.00
Adjustment		
Life Insurance	+ 13.50	
Net Pay	$ 273.85	

*** Excluded from federal taxable wages**

Your federal taxable wages this period are $386.66

Other Benefits and Information	this period	total to date
Group Term Life	0.51	27.00
Loan Balance		840.00
Vac Hrs Left		40.00
Sick Hrs Left		16.00
Title	Operator	

Important Notes

EFFECTIVE THIS PAY PERIOD YOUR REGULAR HOURLY RATE HAS BEEN CHANGED FROM $8.00 TO $10.00 PER HOUR.

WE WILL BE STARTING OUR UNITED WAY FUND DRIVE SOON AND LOOK FORWARD TO YOUR PARTICIPATION.

THE FACE OF THIS DOCUMENT HAS A COLORED BACKGROUND ON WHITE PAPER. THE BACK OF THIS DOCUMENT CONTAINS AN ARTIFICIAL WATERMARK - HOLD AT AN ANGLE TO VIEW

FUTURA PLASTICS AND ENGR., INC.

1920 WATTERSON TRAIL LOUISVILLE, KY 40299

Payroll check number: 0000000001
Pay date: 00/00/00
Social Security No. 999-99-9999

Pay to the order of: JANE HARPER

This amount: TWO HUNDRED SEVENTY-THREE AND 85/100 DOLLARS $273.85

SAMPLE
NON-NEGOTIABLE
VOID VOID VOID

THIS IS NOT A CHECK

CBANK
K, KENTUCKY, INC.
KY

AUTHORIZED SIGNATURE

⑈0000001⑈ ⑆083000108⑆ 3095488304⑈

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SINGLE Persons—**WEEKLY** Payroll Period

(For Wages Paid in 1995)

If the wages are—		And the number of withholding allowances claimed is—										
At least	But less than	0	1	2	3	4	5	6	7	8	9	10
		The amount of income tax to be withheld is—										
$0	$55	0	0	0	0	0	0	0	0	0	0	0
55	60	1	0	0	0	0	0	0	0	0	0	0
60	65	2	0	0	0	0	0	0	0	0	0	0
65	70	3	0	0	0	0	0	0	0	0	0	0
70	75	3	0	0	0	0	0	0	0	0	0	0
75	80	4	0	0	0	0	0	0	0	0	0	0
80	85	5	0	0	0	0	0	0	0	0	0	0
85	90	6	0	0	0	0	0	0	0	0	0	0
90	95	6	0	0	0	0	0	0	0	0	0	0
95	100	7	0	0	0	0	0	0	0	0	0	0
100	105	8	1	0	0	0	0	0	0	0	0	0
105	110	9	1	0	0	0	0	0	0	0	0	0
110	115	9	2	0	0	0	0	0	0	0	0	0
115	120	10	3	0	0	0	0	0	0	0	0	0
120	125	11	4	0	0	0	0	0	0	0	0	0
125	130	12	4	0	0	0	0	0	0	0	0	0
130	135	12	5	0	0	0	0	0	0	0	0	0
135	140	13	6	0	0	0	0	0	0	0	0	0
140	145	14	7	0	0	0	0	0	0	0	0	0
145	150	15	7	0	0	0	0	0	0	0	0	0
150	155	15	8	1	0	0	0	0	0	0	0	0
155	160	16	9	2	0	0	0	0	0	0	0	0
160	165	17	10	2	0	0	0	0	0	0	0	0
165	170	18	10	3	0	0	0	0	0	0	0	0
170	175	18	11	4	0	0	0	0	0	0	0	0
175	180	19	12	5	0	0	0	0	0	0	0	0
180	185	20	13	5	0	0	0	0	0	0	0	0
185	190	21	13	6	0	0	0	0	0	0	0	0
190	195	21	14	7	0	0	0	0	0	0	0	0
195	200	22	15	8	0	0	0	0	0	0	0	0
200	210	23	16	9	2	0	0	0	0	0	0	0
210	220	25	18	10	3	0	0	0	0	0	0	0
220	230	26	19	12	5	0	0	0	0	0	0	0
230	240	28	21	13	6	0	0	0	0	0	0	0
240	250	29	22	15	8	0	0	0	0	0	0	0
250	260	31	24	16	9	2	0	0	0	0	0	0
260	270	32	25	18	11	3	0	0	0	0	0	0
270	280	34	27	19	12	5	0	0	0	0	0	0
280	290	35	28	21	14	6	0	0	0	0	0	0
290	300	37	30	22	15	8	1	0	0	0	0	0
300	310	38	31	24	17	9	2	0	0	0	0	0
310	320	40	33	25	18	11	4	0	0	0	0	0
320	330	41	34	27	20	12	5	0	0	0	0	0
330	340	43	36	28	21	14	7	0	0	0	0	0
340	350	44	37	30	23	15	8	1	0	0	0	0
350	360	46	39	31	24	17	10	2	0	0	0	0
360	370	47	40	33	26	18	11	4	0	0	0	0
370	380	49	42	34	27	20	13	5	0	0	0	0
380	390	50	43	36	29	21	14	7	0	0	0	0
390	400	52	45	37	30	23	16	8	1	0	0	0
400	410	53	46	39	32	24	17	10	3	0	0	0
410	420	55	48	40	33	26	19	11	4	0	0	0
420	430	56	49	42	35	27	20	13	6	0	0	0
430	440	58	51	43	36	29	22	14	7	0	0	0
440	450	59	52	45	38	30	23	16	9	2	0	0
450	460	61	54	46	39	32	25	17	10	3	0	0
460	470	62	55	48	41	33	26	19	12	5	0	0
470	480	64	57	49	42	35	28	20	13	6	0	0
480	490	66	58	51	44	36	29	22	15	8	0	0
490	500	69	60	52	45	38	31	23	16	9	2	0
500	510	72	61	54	47	39	32	25	18	11	3	0
510	520	75	63	55	48	41	34	26	19	12	5	0
520	530	78	64	57	50	42	35	28	21	14	6	0
530	540	80	67	58	51	44	37	29	22	15	8	1
540	550	83	70	60	53	45	38	31	24	17	9	2
550	560	86	73	61	54	47	40	32	25	18	11	4
560	570	89	75	63	56	48	41	34	27	20	12	5
570	580	92	78	65	57	50	43	35	28	21	14	7
580	590	94	81	68	59	51	44	37	30	23	15	8
590	600	97	84	70	60	53	46	38	31	24	17	10

MARRIED Persons—**WEEKLY** Payroll Period

(For Wages Paid in 1995)

If the wages are–		And the number of withholding allowances claimed is—										
At least	But less than	0	1	2	3	4	5	6	7	8	9	10
		The amount of income tax to be withheld is—										
$0	$125	0	0	0	0	0	0	0	0	0	0	0
125	130	1	0	0	0	0	0	0	0	0	0	0
130	135	1	0	0	0	0	0	0	0	0	0	0
135	140	2	0	0	0	0	0	0	0	0	0	0
140	145	3	0	0	0	0	0	0	0	0	0	0
145	150	4	0	0	0	0	0	0	0	0	0	0
150	155	4	0	0	0	0	0	0	0	0	0	0
155	160	5	0	0	0	0	0	0	0	0	0	0
160	165	6	0	0	0	0	0	0	0	0	0	0
165	170	7	0	0	0	0	0	0	0	0	0	0
170	175	7	0	0	0	0	0	0	0	0	0	0
175	180	8	1	0	0	0	0	0	0	0	0	0
180	185	9	2	0	0	0	0	0	0	0	0	0
185	190	10	2	0	0	0	0	0	0	0	0	0
190	195	10	3	0	0	0	0	0	0	0	0	0
195	200	11	4	0	0	0	0	0	0	0	0	0
200	210	12	5	0	0	0	0	0	0	0	0	0
210	220	14	7	0	0	0	0	0	0	0	0	0
220	230	15	8	1	0	0	0	0	0	0	0	0
230	240	17	10	2	0	0	0	0	0	0	0	0
240	250	18	11	4	0	0	0	0	0	0	0	0
250	260	20	13	5	0	0	0	0	0	0	0	0
260	270	21	14	7	0	0	0	0	0	0	0	0
270	280	23	16	8	1	0	0	0	0	0	0	0
280	290	24	17	10	3	0	0	0	0	0	0	0
290	300	26	19	11	4	0	0	0	0	0	0	0
300	310	27	20	13	6	0	0	0	0	0	0	0
310	320	29	22	14	7	0	0	0	0	0	0	0
320	330	30	23	16	9	1	0	0	0	0	0	0
330	340	32	25	17	10	3	0	0	0	0	0	0
340	350	33	26	19	12	4	0	0	0	0	0	0
350	360	35	28	20	13	6	0	0	0	0	0	0
360	370	36	29	22	15	7	0	0	0	0	0	0
370	380	38	31	23	16	9	2	0	0	0	0	0
380	390	39	32	25	18	10	3	0	0	0	0	0
390	400	41	34	26	19	12	5	0	0	0	0	0
400	410	42	35	28	21	13	6	0	0	0	0	0
410	420	44	37	29	22	15	8	1	0	0	0	0
420	430	45	38	31	24	16	9	2	0	0	0	0
430	440	47	40	32	25	18	11	4	0	0	0	0
440	450	48	41	34	27	19	12	5	0	0	0	0
450	460	50	43	35	28	21	14	7	0	0	0	0
460	470	51	44	37	30	22	15	8	1	0	0	0
470	480	53	46	38	31	24	17	10	2	0	0	0
480	490	54	47	40	33	25	18	11	4	0	0	0
490	500	56	49	41	34	27	20	13	5	0	0	0
500	510	57	50	43	36	28	21	14	7	0	0	0
510	520	59	52	44	37	30	23	16	8	1	0	0
520	530	60	53	46	39	31	24	17	10	3	0	0
530	540	62	55	47	40	33	26	19	11	4	0	0
540	550	63	56	49	42	34	27	20	13	6	0	0
550	560	65	58	50	43	36	29	22	14	7	0	0
560	570	66	59	52	45	37	30	23	16	9	1	0
570	580	68	61	53	46	39	32	25	17	10	3	0
580	590	69	62	55	48	40	33	26	19	12	4	0
590	600	71	64	56	49	42	35	28	20	13	6	0
600	610	72	65	58	51	43	36	29	22	15	7	0
610	620	74	67	59	52	45	38	31	23	16	9	2
620	630	75	68	61	54	46	39	32	25	18	10	3
630	640	77	70	62	55	48	41	34	26	19	12	5
640	650	78	71	64	57	49	42	35	28	21	13	6
650	660	80	73	65	58	51	44	37	29	22	15	8
660	670	81	74	67	60	52	45	38	31	24	16	9
670	680	83	76	68	61	54	47	40	32	25	18	11
680	690	84	77	70	63	55	48	41	34	27	19	12
690	700	86	79	71	64	57	50	43	35	28	21	14
700	710	87	80	73	66	58	51	44	37	30	22	15
710	720	89	82	74	67	60	53	46	38	31	24	17
720	730	90	83	76	69	61	54	47	40	33	25	18
730	740	92	85	77	70	63	56	49	41	34	27	20

KENTUCKY WITHHOLDING TAX TABLE
WEEKLY PAYROLL PERIOD

IF THE WAGES ARE -		AND THE NUMBER OF EXEMPTIONS CLAIMED IS–										
AT LEAST	BUT LESS THAN	0	1	2	3	4	5	6	7	8	9	10 or More
		THE AMOUNT OF TAX TO BE WITHHELD SHALL BE										
105	110	2.57	2.18	1.80	1.41	1.03	0.64	0.26				
110	115	2.82	2.43	2.05	1.66	1.28	0.89	0.51	0.12			
115	120	3.07	2.68	2.30	1.91	1.53	1.14	0.76	0.37			
120	125	3.32	2.93	2.55	2.16	1.78	1.39	1.01	0.62	0.24		
125	130	3.57	3.18	2.80	2.41	2.03	1.64	1.26	0.87	0.49	0.11	
130	135	3.82	3.43	3.05	2.66	2.28	1.89	1.51	1.12	0.74	0.36	
135	140	4.07	3.68	3.30	2.91	2.53	2.14	1.76	1.37	0.99	0.61	0.22
140	145	4.32	3.93	3.55	3.16	2.78	2.39	2.01	1.62	1.24	0.86	0.47
145	150	4.57	4.18	3.80	3.41	3.03	2.64	2.26	1.87	1.49	1.11	0.72
150	155	4.82	4.43	4.05	3.66	3.28	2.89	2.51	2.12	1.74	1.36	0.97
155	160	5.07	4.68	4.30	3.91	3.53	3.14	2.76	2.37	1.99	1.61	1.22
160	165	5.32	4.93	4.55	4.16	3.78	3.39	3.01	2.62	2.24	1.86	1.47
165	170	5.60	5.22	4.83	4.45	4.06	3.68	3.30	2.91	2.53	2.14	1.76
170	175	5.90	5.52	5.13	4.75	4.36	3.98	3.60	3.21	2.83	2.44	2.06
175	180	6.20	5.82	5.43	5.05	4.66	4.28	3.90	3.51	3.13	2.74	2.36
180	185	6.50	6.12	5.73	5.35	4.96	4.58	4.20	3.81	3.43	3.04	2.66
185	190	6.80	6.42	6.03	5.65	5.26	4.88	4.50	4.11	3.73	3.34	2.96
190	195	7.10	6.72	6.33	5.95	5.56	5.18	4.80	4.41	4.03	3.64	3.26
195	200	7.40	7.02	6.63	6.25	5.86	5.48	5.10	4.71	4.33	3.94	3.56
200	205	7.70	7.32	6.93	6.55	6.16	5.78	5.40	5.01	4.63	4.24	3.86
205	210	8.00	7.62	7.23	6.85	6.46	6.08	5.70	5.31	4.93	4.54	4.16
210	215	8.30	7.92	7.53	7.15	6.76	6.38	6.00	5.61	5.23	4.84	4.46
215	220	8.60	8.22	7.83	7.45	7.06	6.68	6.30	5.91	5.53	5.14	4.76
220	225	8.90	8.52	8.13	7.75	7.36	6.98	6.60	6.21	5.83	5.44	5.06
225	230	9.20	8.82	8.43	8.05	7.66	7.28	6.90	6.51	6.13	5.74	5.36
230	235	9.50	9.12	8.73	8.35	7.96	7.58	7.20	6.81	6.43	6.04	5.66
235	240	9.80	9.42	9.03	8.65	8.26	7.88	7.50	7.11	6.73	6.34	5.96
240	245	10.10	9.72	9.33	8.95	8.56	8.18	7.80	7.41	7.03	6.64	6.26
245	250	10.40	10.02	9.63	9.25	8.86	8.48	8.10	7.71	7.33	6.94	6.56
250	255	10.70	10.32	9.93	9.55	9.16	8.78	8.40	8.01	7.63	7.24	6.86
255	260	11.00	10.62	10.23	9.85	9.46	9.08	8.70	8.31	7.93	7.54	7.16
260	265	11.30	10.92	10.53	10.15	9.76	9.38	9.00	8.61	8.23	7.84	7.46
265	270	11.60	11.22	10.83	10.45	10.06	9.68	9.30	8.91	8.53	8.14	7.76
270	275	11.90	11.52	11.13	10.75	10.36	9.98	9.60	9.21	8.83	8.44	8.06
275	280	12.20	11.82	11.43	11.05	10.66	10.28	9.90	9.51	9.13	8.74	8.36
280	285	12.50	12.12	11.73	11.35	10.96	10.58	10.20	9.81	9.43	9.04	8.66
285	290	12.80	12.42	12.03	11.65	11.26	10.88	10.50	10.11	9.73	9.34	8.96
290	295	13.10	12.72	12.33	11.95	11.56	11.18	10.80	10.41	10.03	9.64	9.26
295	300	13.40	13.02	12.63	12.25	11.86	11.48	11.10	10.71	10.33	9.94	9.56
300	310	14.00	13.62	13.23	12.85	12.46	12.08	11.70	11.31	10.93	10.54	10.16

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Project Future
Competency Area 2.0: Mathematics

Competency Number 2.3: Decimals

Lesson Number 2.3.4: Compute Averages from Production Reports, Divide Decimals

Lesson Objective: Using information from a Production Report, the trainee will correctly complete 15 of 20 problems involving the division of decimals.

Prerequisite Skills: The trainee must be able to read and understand whole numbers.
The trainee must be able to add, subtract, multiply, and divide whole numbers.
The trainee must be able to understand place values of decimals.

Literacy Skills: The trainee will add and divide decimals.
The trainee will locate information on a spreadsheet.
The trainee will compute averages.

Presentation:

I. The trainer will introduce the lesson by asking the trainees what the average scrap dollars per hour were on the machine that they ran during the last shift they worked. Do they know how to find it? Using the board, the trainer will demonstrate the division of a whole number. Beside it, the trainer will demonstrate the division of a decimal number with the same digits so that the trainees can visualize the placement of the decimal point.

II. The trainees will use the production report to complete the exercise-, Practice in Dividing Decimals.

Evaluation: The trainees will practice the division of decimals by completing the exercise, Computing the Averages

Extension Activity: Living Healthfully--The trainees will use the labels on several food items to compute the amount of fat, calories, and other nutrients per serving. Trainees will use the total cost of the product to determine the cost per unit (cents/ounce or gram). Based on this information, the trainees will make choices between various products to incorporate into a healthy diet.

Practice In Dividing Decimals

Practice dividing decimals by solving the following problems. You may wish to re-write them in a different format.

1. $.25 \div .5 =$

2. $25 \div .5 =$

3. $125.33 \div .15 =$

4. $333.33 \div 1.11 =$

5. $.8\,\overline{)\,32}$

6. $.7\,\overline{)\,.56}$

7. $.25\,\overline{)\,1.25}$

8. $4\,\overline{)\,2.4}$

9. $.60\,\overline{)\,36.01}$

10. $.3\,\overline{)\,2.7}$

11. $65 \div 5.1 =$

12. $9.8 \div .7 =$

13. $\$90 \div 6.1 =$

14. $27.5 \div .5 =$

15. $8 \div 9.9 =$

16. The second shift produced 839.55 boxes of parts. There are 29 machine operators on the second shift. What is the average production per operator for this shift?

17. There were 3, 897 FIG86 parts shipped on Friday, October 28. The total value of the shipment was $5, 689.89. How much is each part worth?

18. 216.5 boxes of the parts in problem 17 were shipped. How many parts were shipped in each box?

19. The company has offered to buy back your remaining vacation days for $81. If your hourly wage is $6.75 , how many vacation days do you have remaining?

20. The cost of your lunches for the past full week is $83.79. If each lunch cost the same amount, how much did each lunch cost?

Computing the Averages

Using the information from the Production Report you are given, compute the following problems:

1. What is the average of the standard cycles of all machines?
2. What is the average of the number of hours up?
3. What is the average of the Dollars Sales?
4. What is the total of the number of dollars produced by machine number 1?
5. What is the average of scrap dollars for all machines?
6. What is the average number of parts actually produced on the shift?
7. What is the average of the optimum production of machines 5, 6, 14, 22, 23, and 10?
8. What is the average of the scrap dollars of machines 3, 5, 14, 15, 18, and 21?
9. What is the average selling price of FISA3, FIS87, FIS79, FISA4, FIS82, FIS89, and FIS31?

10--20. Complete the following chart by computing the dollars per hour contributed by the listed machines.

Machine Num.	Hours Up	Dollars Sales	Dollars/Hour
5	7.8	$877.82	
6	6.3	$734.85	
7	5.1	$828.38	
8	7.6	$401.50	
9	7.5	$179.01	
10	1.2	$ 96.50	
11	4.9	$369.63	
12	7.8	$545.20	
13	7.7	$679.05	
14	5.4	$432.99	
15	7.9	$894.31	

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Computing the Averages

Using the information from the Production Report you are given, compute the following problems:

1. What is the average of the standard cycles of all machines? *44.35 seconds*

2. What is the average of the number of hours up? *5.925 hours*

3. What is the average of the Dollars Sales? *$513.4115*

4. What is the average of the number of dollars in sales produced by machines 1, 9, and 18? *$420.8133...*

5. What is the average of scrap dollars for all machines? *$69.018*

6. What is the average number of parts actually produced on the shift? *955*

7. What is the average of the optimum production of machines 5, 6, 14, 22, 23, and 10? *1304.333...*

8. What is the average of the scrap dollars of machines 4, 5, 14, 15, 18, and 21? *$63.61833*

9. What is the average selling price of FISA3, FIS87, FIS79, FISA4, FIS82, FIS89, and FIS31? *$1240.8657*

10 - 20. Complete the following chart by computing the dollars per hour contributed by the listed machines.

Machine Num	Hours Up	Dollars Sales	Dollars/Hour
5	7.8	$877.82	*$112.54102*
6	6.3	$734.85	*$116.64285*
7	5.1	$828.38	*$162.42745*
8	7.6	$401.50	*$ 52.828947*
9	7.5	$179.01	*$ 23.868*
10	1.2	$ 96.50	*$ 80.416666*
11	4.9	$369.63	*$ 75.434693*
12	7.8	$545.20	*$ 69.897435*
13	7.7	$679.05	*$ 88.188311*
14	5.4	$432.99	*$ 80.183333*
15	7.9	$894.31	*$113.20379*

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Project Future
Competency Area 2.0: Mathematics

Competency Number 2.4: Percentages

Lesson Number 2.4.1: Understand the Relationship of Percentages, Decimals, and Fractions.

Lesson Objective: Using information from several sources in the plant, the trainee will correctly complete 15 of 20 problems by illustrating the decimal and percentage equivalents.

Prerequisite Skills: The trainee must be able to read and understand whole numbers.
The trainee must be able to add, subtract, multiply, and divide whole numbers.
The trainee must be able to understand place values of decimals.

Literacy Skills: The trainee will compute decimals, percents, and fractional equivalents.
The trainees will place information within a table.

Presentation:

I. The trainer will explain that a percentage is a short way of saying *per* or *by the hundred*. The trainer will demonstrate how to write a percentage (10%) by writing it on the board. The trainer will explain that the percentage is just a special type of fraction. The only denominator it can have is 100. However, instead of writing the denominator, we use a % sign. To change a decimal to a percentage, move the decimal point two places to the right and write the percent sign. If the point moves to the end of the number, you do not have to write the point. The trainer will demonstrate three or four problems on the board.

II. The trainees will complete the exercise, Fractions, Decimals, and Percentages, Table of Equivalents. The trainer will explain that this table lists the most commonly used fractions, decimals, and percents. It might be a good idea for the trainees to memorize the table. The trainees will share answers as a group with members taking turns sharing answers.

Evaluation: The trainees will complete the exercise, Fractions, Decimals, and Percents In The Plastics Industry.

Extension Activity: Using a newspaper with sale advertisements, trainees will break into small groups and go on a scavenger hunt to locate the best price on several items.

Fractions, Decimals, and Percentages
Table of Equivalents

Fraction	Decimal	Percentage
1/4	.25	25%
1/2	*.50*	*50%*
3/4	*.75*	*75%*
1/3	*.33*	*33%*
2/3	*.66*	*66%*
1/5	*.20*	*20%*
3/5	*.60*	*60%*
1/10	*.10*	*10%*
3/10	*.30*	*30%*
9/10	*.90*	*90%*
1/20	*.05*	*5%*
1/1	*1.0*	*100%*

Fractions, Decimals, and Percentages Table of Equivalents

Fraction	Decimal	Percentage
1/4	.25	25%
1/2		
3/4		
1/3		
2/3		
1/5		
3/5		
1/10		
3/10		
9/10		
1/20		
1/1		

Fractions, Decimals, and Percents In The Plastics Industry

The following numbers are from a Production Report.

Change the percentages to decimals.

1. 15.8% =
2. 12.5% =
3. 6.3% =
4. 12.7% =
5. 0.3% =
6. 7.4% =
7. 23.4% =

Change the following decimals to percentages.

1. .108 =
2. .244 =
3. .044 =
4. .010 =
5. .195 =
6. .067 =
7. .218 =

Change the following decimals to fractions.

1. .758 =
2. .544 =
3. .44 =
4. .51 =
5. 1.75 =
6. .67 =

Project Future
Competency Area 2.0: Mathematics

Competency Number 2.4: Percentages

Lesson Number 2.4.2: Compute Percentage of Colorant in Molding Mixture

Lesson Objective: Using information from the Production Schedule, the trainee will be able to compute the pounds of colorant needed to produce a part of the correct color.

Prerequisite Skills: The trainee must be able to read and understand whole numbers and decimals.
The trainee must be able to add, subtract, multiply, and divide whole numbers and decimals.
The trainee must be able to read a simple table.

Literacy Skills: The trainee will compute whole numbers, decimals, and percents.
The trainee will find the percent of a number.

Presentation:

I. Using the board, the trainer will demonstrate how to find the percent of a number by changing the percent to a decimal. The trainer will demonstrate five or more problems.

II. The trainee will complete the exercise, Practice Finding a Percent of a Number. Trainees will self score this exercise.

Evaluation: Given a Production Schedule, the trainees will correctly compute the pounds of colorant to add to a Gaylord (1000 pounds) of resin to produce a part with the correct color.

Extension Activity: Using three or four credit applications, the trainees will determine the best deals on credit terms and the amount of savings from selecting the lower rates.

Practice Finding a Percent of a Number

It is vital in the plastics industry to be able to compute percentages. Percentages represent a portion of each 100 items. Percents show how many parts of a total are taken out. Percents are used to make comparisons and compute wages, taxes, discounts, and increases or decreases in production.

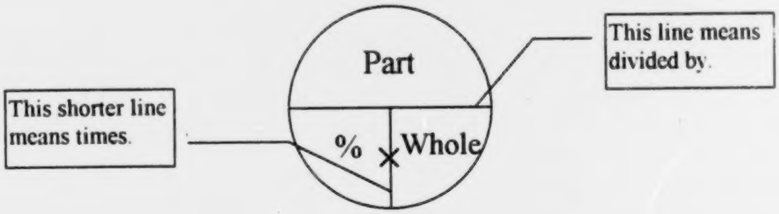
The word percent is a short way of saying "by the hundred" or "hundredths part of the whole." A percent refers to a given number of parts of the whole, which is equal to 100 percent.

Percent is another form of a mathematical expression. Fifty percent may be represented by saying 50%. It may also be given in an equivalent form, such as the fraction 50/100 or as the decimal .50 (five tenths).

There are two ways to remember how to find a percent of a number. One way is to:

- Convert the percent to a decimal equivalent.
- Multiply the given number by this equivalent.
- Count off the same number of decimal places in the product as there are in the multiplier and the multiplicand (the two numbers you multiplied together).

Another way to remember is to use the percent circle. The percent circle is a memory tool and can be used for all percentage problems. The percent circle is shown below.



To use the percent circle, you simply cover over the part of the circle that you are looking for. For example, if the problem gives you the percentage (%) and the Whole, you would put your hand over the Part because that is what you are looking for. Then you follow the operation indicated by the line to get the answer. In the example, you would multiply the Percentage by the Whole. This would tell you the Part.

Use either of these methods to solve the following percent problems which require you to find a percent of a number.

1. What is 18 percent of 36?
2. What is 25 % of 100?
3. What is 33% of 45?
4. What is 66 percent of 90?
5. What is 9.6 % of 1098?
6. What is 12.8 % of 889?
7. What is 19.8 % of 245?
8. What is 22% of 356
9. What is 25 % of 18.53?
10. What is 33.3% of 120?
11. If the scrap percentage on third shift was 15.8% and they produced 771 parts, how many scrap parts did they produce?
12. If the percentage of scrap was 12.5% and 476 parts were produced, how many parts were scrap?
13. If the percentage of scrap was 10.8% and 796 parts were produced, how many parts were scrap?
14. If you worked 108% of your normal 40 hour week, how many hours did you work?
15. If the percentage of scrap was 10.8% and 796 parts were produced, how many parts were scrap?
16. If the percentage of scrap was 10.8% and 796 parts were produced, how many parts were scrap?
17. If the percentage of scrap was 10.8% and 796 parts were produced, how many parts were scrap?
18. If the percentage of scrap was 10.8% and 796 parts were produced, how many parts were scrap?

19. If the percentage of scrap was 10.8% and 796 parts were produced, how many parts were scrap?

20. If the percentage of scrap was 10.8% and 796 parts were produced, how many parts were scrap?

```
06-09-1995                  PRODUCTION  SCHEDULE       FOR DATE
                                                                                          6/9-6/12
# OF  |MACH| PART | DESCRIPTION          | STD |PART    |RUNNER |RESIN|COLOR|COLOR|CARTON| NUMBER|PRI |MOLD |
PEOPLE| NO.| CODE |                      | CYC |WT/M    |GRAMS  | CODE|CODE |USAGE| SIZES|PCS/CTN|RUN |NUMB |
      |    |      |                      |     |        |       |     |     |  %  |      |       |    |     |
1.0   | 2  |FISA1 |170094-4051 F/-4061 R |  36| 440.53|   0.00|RPP38|CBR58| 3   |P0109 |  100  | /  | 4800|  RUN 21800 PCS.THEN RUN 21800 PCS.
1.0   | 3  |HUDA2 |15945 | 1/4 BLK SHORT |  50| 658.59|   0.00|RPS14|CBL05| 2   |P0023 |   40  |/5  | 2211|  RUN 5000 PCS.OK TO OVER-RUN THEN INSERT CHANGE TO LONG LEGS
2.0   | 3  |HUDA5 |R5942 | 1/4 GREEN ST  |  45| 572.69|   0.00|RPS01|CGR06| 4   |P0023 |   35  | ✓  | 2211|  RUN 15000 PCS.                                                        **
1.0   | 4  |SFT14 |ED160 UDELL CASE      | 120|3028.63|  21.10|RMC19|NONE | 0   |P0013 |  156  |/10 | 2139|  RUN 3000 PCS.
1.0   | 5  |FIS93 |170075-3100           |  47|1202.64|   0.00|RPS43|CRD53| 3   |P0106 |    9  | 9  | 3632|  RUN 12300 PCS.THEN RUN 12300 PCS.
0.3   | 6  |JCUF4 |L0R ENDCAPS WHITE     |  23|  68.00|   0.00|RPS41|CWT35| 4   |P0023 |  650  |    | 1202|  RUN 21000 PCS.    START ONLY IF EVERYTHING IS GOING WELL              **
1.0   | 8  |KDL98 |141056/44496          |  40| 960.00|   0.00|RPC12|NONE | 0   |P0003 |   25  |/4  |    7|  RUN 2000 PCS.OK TO OVER-RUN UP TOTAL OF 2300 PCS.THEN SHUT-DOWN      **
1.0   | 9  |HAMP1 |CLIP                  |  20|   5.23|   0.00|RMC08|NONE | 0   |P0001 | 2000  | A  | 2227|  RUN 50000 PCS.THEN RUN 100000 PCS.
1.0   | 10 |WES17 |EN10060 CLEAR LID     |  70| 341.41|   0.00|RMC26|NONE | 0   |P0002 |  120  |[illegible]|  748|  RUN 5500 PCS.
1.0   | 11 |ATG05 |BELT LINK HUMP/AQUA   |  45| 177.30|  37.30|RPP09|CBU41| 3   |P0002 |  600  |/3  | 2241|  RUN 63 BELTS — Potato chip
1.0   | 12 |FISA7 |170094-4031 FRONT WAL |  35| 660.79|   0.00|RPS43|CRD01| 3   |P0109 |  100  | 2  | 4738|  RUN 21800 PCS.THEN RUN 21800 PCS.
2.0   | 13 |GENR2 |1162D3035P004 CCV HIN |  20|  70.44|   0.00|RABP1|CWT10| 1   |P0002 |  196  | 1  | 2246|  RUN 45000 PCS.
1.0   | 14 |HAMP8 |HAMILTON DIV.CLIP     |  30|  82.60|   0.00|RPS01|CBL05| 4   |P0002 |  200  | A  | 2238|  RUN 26200 PCS.
1.0   | 16 |ICS21 |STAB. RED COKE/1230   |  35|2129.30|   0.00|RPE25|CRD49| 3   |P0100 |  161  | 5  | 1230|  RUN TILL TOLD TO STOP
1.0   | 17 |FIS00 |170094-4041 REAR WALL |  35| 660.79|   0.00|RPS43|CRD01| 3   |P0109 |  100  | 4  | 4799|  RUN 21800 PCS.  THEN RUN 21800 PCS.
1.0   | 18 |FIS02 |170086-5261/71/81     |  36| 938.32|  28.70|RPS43|CWT39| 3   |P0106 |   65  | 7  |13616|  RUN 13800 PCS.THEN RUN 13800 PCS.
1.0   | 20 |FIS03 |170091-0603           |  45|1951.54|   0.00|RPP38|CRD52| 3   |P0105 |   15  | 3  |13614|  RUN 5000 PCS...THEN NEXT BOX COUNT SHEET FOR 5000
1.0   | 21 |FIS32 |170082-741C YEL TRAY  |  35| 207.05|   0.00|RPS43|CYL28| 2   |P0109 |   98  |/2  | 4124|  RUN 10400 PCS.THEN COLOR CHANGE TO BLUE RUN 27600 PCS.FIS31
1.0   | 21 |FIS31 |170082-7410 USA BLUE  |  35| 207.00|   0.00|RPS43|CBU36| 5   |P0109 |   98  | x  | 4124|  RUN 27600 PCS.
2.0   | 22 |GEN07 |1162D5683P003 WP/663  |  55|1046.26|   0.00|RPP06|NONE | 0   |P0085 |  120  | 8  |  663|  RUN TILL TOLD TO STOP
1.0   | 23 |ICS03 |STAB. RED COKE/1220   |  35|2129.30|   0.00|RPE25|CRD49| 3   |P0100 |  161  | 6  | 1228|  RUN TILL TOLD TO STOP!!!!!!!!!!!!!!!!!!!!!!!!!
0.0   | 24 |DOWN  |DOWN                  |   1|   1.00|   0.00|R0000|R0000| 0   |00000 |    0  |    |    0|  MOLD CHANGES: NONE   INSERT CHANGE 3         ** EQUALS CHANGES IN SCHEDULE
```

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Project Future
Competency Area 2.0: Mathematics

Competency Number 2.4: Percentages

Lesson Number 2.4.3: Calculate Shift Productivity, Average Scrap Percentage, and Shift Loss Percentage

Lesson Objective: Using information from the Production Report, the trainee will be able to complete a Shift Analysis by correctly calculating the shift's productivity, the average scrap percentage, and the shift-loss percentage for a shift.

Prerequisite Skills: The trainee must be able to read and understand whole numbers and decimals.
The trainee must be able to add, subtract, multiply, and divide whole numbers and decimals.
The trainee must understand place values of decimals.

Literacy Skills: The trainee will compute whole numbers, decimals, and percents.
The trainee determines what percent one number is of another.

Presentation:

I. Using the board, the trainer will demonstrate finding what percent one number is of another number. The trainer will demonstrate five or more problems.

II. The trainee will complete the exercise, Practice Finding What Percent One Number is of Another. Trainees will self score this exercise.

Evaluation: Given a Production Report, the trainees will supply the missing information by applying the demonstrated method for using percentages.

Extension Activity: Using a product catalogue that lists suggested retail prices and their lower everyday sale prices, the trainees will calculate the percentage of savings.

Practice Finding What Percent One Number Is of Another

It is vital in the plastics industry to be able to compute percentages. Percentages represent a portion of each 100 items. Percents show how many parts of a total are taken out. Percents are used to make comparisons and compute wages, taxes, discounts, and increases or decreases in production.

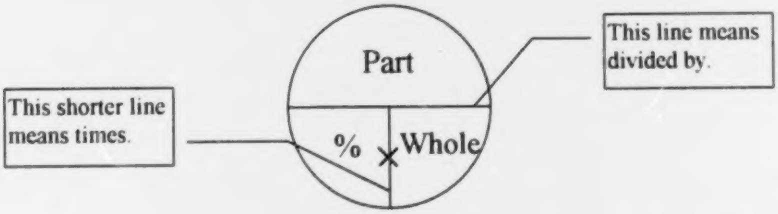
The word percent is a short way of saying "by the hundred" or "hundredths part of the whole." A percent refers to a given number of parts of the whole that is equal to 100 percent.

Percent is another form of a mathematical expression. Fifty percent may be represented by saying 50%. It may also be given in an equivalent form, such as the fraction 50/100 or as the decimal .50 (five tenths).

There are two ways to remember how to find what percent one number is of another. One way is to:

- Make a fraction by putting the part (usually the smaller number) over the whole.
- Reduce the fraction.
- Change the fraction into a decimal by dividing the bottom number into the top number.
- Change the decimal to a percent by moving the decimal point two places to the right and adding a percent (%)sign.

Another way is to use the percent circle. The percent circle is a memory tool and can be used for all percentage problems. The percent circle is shown below.



To use the percent circle, you simply cover over the part of the circle that you are looking for. For example, if the problem gives you the percentage (%) and the Whole, you would put your hand over the Part because that is what you are looking for. Then you follow the operation indicated by the line to get the answer. In the example, you would multiply the Percentage by the Whole. This would tell you the Part.

Use either of these methods to solve the following percent problems that require you to find what percent one number is of another.

1. 18 is what percent of 36?
2. 25 is what percent of 100?
3. 45 is what percent of 100?
4. 66 is what percent of 90?
5. 10 is what percent of 98?
6. 49 is what percent of 445?
7. 245 is what percent of 1890?
8. 69 is what percent of 356?
9. 180 is what percent of 657?
10. 24 is what percent of 120?
11. If 145 scrap parts were produced on third shift and 916 shots were made on a one-part mold, what was the scrap percentage? (145 is what % of 916?)
12. If 68 scrap parts were produced and 544 shots were made on a one-part mold, what was the scrap percentage?
13. If 34 scrap parts were produced and 539 shots were made on a one-part mold, what was the scrap percentage?
14. If 95 scrap parts were produced and 375 shots were made on a two-part mold, what was the scrap percentage?
15. If 1,462 scrap parts were produced and 993 shots were made on a four-part mold, what was the scrap percentage?
16. If 292 scrap parts were produced and 747 shots were made on a two-part mold, what was the scrap percentage?
17. If 150 scrap parts were produced and 308 shots were made on a two-part mold, what was the scrap percentage?
18. If 9 scrap parts were produced and 23 shots were made on a one-part mold, what was the scrap percentage?

19. If 96 scrap parts were produced and 446 shots were made on a two-part mold, what was the scrap percentage?

20. If 10 scrap parts were produced and 43 shots were made on a one-part mold, what was the scrap percentage?

MACH NO.	PART CODE	DESCRIPTION	AVG CYC	STD CYC	TOTAL SHOTS	OPTM PROD	ACT PROD	SCRAP PARTS	TOTAL LOSS	% SCRAP	% LOSS	HRS UP	DOLLARS SALES	$/ HR	SELLING PRICE	SCRAP DOLLARS
1	RAS04	6591-11-1104-4115 A/	28.0	30.0	916	854	771	145	83			7.1	$353.00	$40.68	$450.88	$66.54
2	FIS79	70077-9663YLPEG/3837	51.7	47.0	544	598	476	68	122			7.0	$877.82	$34.72	$1844.15	$125.40
3	HUD03	A5942 1 1/4 BLACK SI	48.7	45.0	468	1013	940	0	73			6.3	$734.85	$55.70	$781.75	$0.00
4	FIS87	70077-9423 ASSY TABL	53.1	43.0	539	666	505	34	161			8.0	$1127.12	$38.78	$2231.92	$75.09
5	FISA3	70079-1531 MT BASE	48.6	45.0	375	810	655	95	155			5.1	$828.38	$38.54	$1264.70	$120.15
6	GEN02	162D3835P004 COV HIN	32.7	20.0	836	5465	3335	9	2130			7.6	$401.50	$24.52	$120.39	$1.08
9	HAM01	CLIP	29.5	28.0	918	3867	3400	272	467			7.5	$179.01	$19.89	$52.65	$14.32
10	WES27	EN10142 BASE	102.1	100.0	43	44	33	10	11			1.2	$96.50	$42.21	$2924.20	$29.24
11	ATG05	BELT LINK HUMP/AQUA	52.9	45.0	336	1581	840	504	741			4.9	$369.63	$55.84	$440.04	$221.78
13	FIS31	70082-7418 USA BLUE	28.3	35.0	993	3209	2510	1462	699			7.8	$545.20	$33.16	$217.21	$317.56
14	DUV08	CD4061 6 PC COMBO	48.0	50.0	569	546	531	38	15			7.6	$769.95	$94.24	$1450.00	$55.10
15	KPL49	42169 BODY W/LENS	50.4	45.0	311	348	297	14	51			4.4	$385.37	$52.59	$1297.55	$18.17
16	ICS21	STAB. RED COKE/1230	46.2	35.0	623	822	826	0	0			8.0	$305.62	$38.25	$370.00	$0.00
17	FISA4	SEAT 2331/PED 2493	37.0	30.0	747	1841	1202	292	639			7.7	$596.76	$14.47	$496.47	$144.97
18	FIS82	70086-5261/71/81	36.1	36.0	797	799	789	8	10			8.0	$729.63	$42.55	$924.75	$7.40
20	FIS89	70091-0603	48.6	45.0	590	637	564	26	73			8.0	$962.67	$46.21	$1706.86	$44.38
21	RAS11	6591-11-1404-4111 W/	36.4	27.0	308	829	466	150	363			3.1	$163.10	$74.30	$350.00	$52.50
22	GLN07	162D5683P003 WP/663	55.4	55.0	446	898	796	96	102			6.9	$712.10	$37.68	$894.60	$85.88
23	ICS03	STAB. RED COKE/1228	43.1	35.0	61	75	141	0	0			0.7	$52.17	$71.47	$370.00	$0.00
10	WES1T	EN10098 LG. BASE	125.2	91.0	23	32	23	0	9			0.8	$77.05	$42.43	$3350.00	$0.00

Shift Analyzation

Shift Total Scrap Dollars..........:
Shift Average Scrap Percentage.....:
Shift Scrap Percentage.............:
Shift Loss Percentage..............:
Shift Machine Utilization..........:
Shift Productivity.................:
Average Machine Rate.(Uptime Hrs).:
Total Machine Hours................:
Total Dollar Sales.................:
Total Dollars Contribution.........:

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Project Future
Competency Area 2.0: Mathematics

Competency Number 2.4:	Percentages
Lesson Number 2.4.4:	Calculate Taxes Deducted from Payroll Checks
Lesson Objective:	Using tax tables and tables of percentages for deductions, the trainee will determine the amount of his next payroll check.
Prerequisite Skills:	The trainee must be able to read and understand whole numbers and decimals. The trainee must be able to add, subtract, multiply, and divide whole numbers and decimals. The trainee must be able to read simple tables.
Literacy Skills:	The trainee will be able to compute whole numbers, decimals, and percents. The trainee will be able to find a percent of a number. The trainee will be able to determine what percent one number is of another. The trainee will be able to find a number when a percent of it is given.

Presentation:

I. The trainer will demonstrate five or more examples of the process for finding a number when a percent of it is given.

II. The trainee will complete the exercise, Practice Finding a Number When a Percent of it is Given. Trainees will self score this exercise.

III. Given a Sample Earnings Statement , the trainer will read through the form as the trainees read along. The trainer will explain terms that may be unfamiliar to the trainees, such as statutory, other benefits (what may fit under this category), Net Pay vs. Gross Pay, and 401K. The trainer will ask the trainees to locate various pieces of information on the statement, such as the amount of the federal income tax, the amount of the year-to-date contribution to the stock plan, etc.

IV. Using the federal and state tax tables and an overhead projector, the trainer will explain how to use the tables.

V. The trainer will explain that the handout, Other Deductions gives the percentage of taxes for city taxes, Medicare, and the amount of health insurance payments that the trainees are to use in completing the exercises, which contain several scenarios.

The learners may work in small groups or alone. The trainer will allow for sharing of answers.

Evaluation: Using the same information, the trainees will compute the amount of their next check. The trainer will check the trainees' work to be sure all steps were correctly followed.

Extension Activity: The trainees will prepare a family budget, using their net income. The trainees will solve problems involving scenarios of emergency situations that could derail their budgets.

Practice Finding a Number When a Percent of It Is Given

It is vital in the plastics industry to be able to compute percentages. Percentages represent a portion of each 100 items. Percents show how many parts of a total are taken out. Percents are used to make comparisons and compute wages, taxes, discounts, and increases or decreases in production.

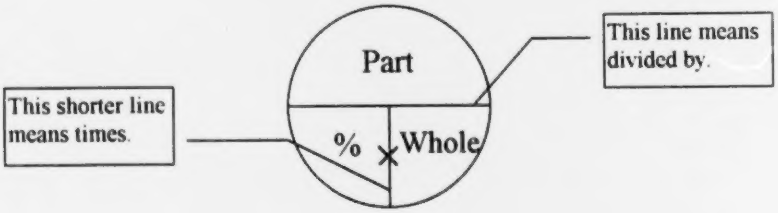
The word percent is a short way of saying "by the hundred" or "hundredths part of the whole." A percent refers to a given number of parts of the whole that is equal to 100 percent.

Percent is another form of a mathematical expression. Fifty percent may be represented by saying 50%. It may also be given in an equivalent form, such as the fraction 50/100 or as the decimal .50 (five tenths).

There are two ways to remember how to find a number when a percent of it is given. One way is to:

- Change the percent into a decimal.
- Divide the number you have by the decimal.

Another way is to use the percent circle. The percent circle is a memory tool and can be used for all percentage problems. The percent circle is shown below.



To use the percent circle, you simply cover over the part of the circle that you are looking for. For example, if the problem gives you the percentage (%) and the Whole, you would put your hand over the Part because that is what you are looking for. Then you follow the operation indicated by the line to get the answer. In the example, you would multiply the Percentage by the Whole. This would tell you the Part.

Use either of these methods to solve the following percent problems that require you to find a a number when a percent of it is given.

1. 36% of what number is 6?

2. 25% of what number is 100?

3. 65% of what number is 100?

4. 66% of what number is 39?

5. 81% of what number is 778?

6. 78% of what number is 675?

7. 35% of what number is 18.90?

8. 69% of what number is 356?

9. 1.8% of what number is 65?

10. 42% of what number is 12.5?

11. If 83 scrap parts were produced on third shift and there was a 15.8% scrap rate, what was the total number of parts produced?

12. If 68 scrap parts were produced on third shift and there was a 12.5% scrap rate, what was the total number of parts produced?

13. If 34 scrap parts were produced on third shift and there was a 6.3% scrap rate, what was the total number of parts produced?

14. If 95 scrap parts were produced on third shift and there was a 12.7% scrap rate, what was the total number of parts produced?

15. If 9 scrap parts were produced on third shift and there was a .3% scrap rate, what was the total number of parts produced?

16. If 272 scrap parts were produced on third shift and there was a 7.4% scrap rate, what was the total number of parts produced?

17. If 10 scrap parts were produced on third shift and there was a 23.3% scrap rate, what was the total number of parts produced?

18. If 504 scrap parts were produced on third shift and there was a 37.5% scrap rate, what was the total number of parts produced?

19. If 1,462 scrap parts were produced on third shift and there was a 36.8% scrap rate, what was the total number of parts produced?

20. If 26 scrap parts were produced on third shift and there was a 4.4% scrap rate, what was the total number of parts produced?

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FUTURA PLASTICS AND ENGR., INC.

1920 WATTERSON TRAIL LOUISVILLE, KY 40299

Period ending: 00/00/00
Pay date: 00/00/00

Social Security Number: 999-99-9999
Taxable Marital Status: Married
Exemptions/Allowances:
Federal: 3,$25 Additional Tax
State: 2
Local: 2

JANE HARPER
101 MAIN STREET
ANYTOWN, USA 12345

Earnings	rate	hours	this period	year to date
Regular	10.00	32.00	320.00	16,640.00
Overtime	15.00	1.00	15.00	780.00
Holiday	10.00	8.00	80.00	4,160.00
Tuition			37.43 *	1,946.80
Gross Pay			$ 452.43	23,526.80

Deductions		this period	year to date
	Statutory		
	Federal Income Tax	- 45.22	2,351.44
	Social Security Tax	- 29.83	1,551.67
	Medicare Tax	- 6.98	362.89
	NY State Income Tax	- 17.37	903.24
	NYC Income Tax	- 8.23	427.96
	NY SUI/SDI Tax	- 0.60	31.20
	Voluntary		
	Union Dues	- 5.00	100.00
	401(K)	- 28.85 *	1500.20
	Stock Plan	- 15.00	150.00
	Life Insurance	- 5.00	50.00
	Loan	- 30.00	150.00
	Adjustment		
	Life Insurance	- 13.50	
	Net Pay	$ 273.85	

* Excluded from federal taxable wages

Your federal taxable wages this period are $386.66

Other Benefits and Information	this period	total to date
Group Term Life	0.51	27.00
Loan Balance		840.00
Vac Hrs Left		40.00
Sick Hrs Left		16.00
Title	Operator	

Important Notes

EFFECTIVE THIS PAY PERIOD YOUR REGULAR HOURLY RATE HAS BEEN CHANGED FROM $8.00 TO $10.00 PER HOUR.

WE WILL BE STARTING OUR UNITED WAY FUND DRIVE SOON AND LOOK FORWARD TO YOUR PARTICIPATION.

THE FACE OF THIS DOCUMENT HAS A COLORED BACKGROUND ON WHITE PAPER. THE BACK OF THIS DOCUMENT CONTAINS AN ARTIFICIAL WATERMARK - HOLD AT AN ANGLE TO VIEW

FUTURA PLASTICS AND ENGR., INC.

1920 WATTERSON TRAIL LOUISVILLE, KY 40299

Payroll check number: 0000000001
Pay date: 00/00/00
Social Security No. 999-99-9999

Pay to the order of: JANE HARPER

This amount: TWO HUNDRED SEVENTY-THREE AND 85/100 DOLLARS $273.85

SAMPLE
NON-NEGOTIABLE
VOID VOID VOID

THIS IS NOT A CHECK

CBANK
KENTUCKY, INC.

AUTHORIZED SIGNATURE

⑈0000000 1⑈ ⑆083000108⑆ 3095488304⑈

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SINGLE Persons—**WEEKLY** Payroll Period

(For Wages Paid in 1995)

If the wages are–		And the number of withholding allowances claimed is—										
At least	But less than	0	1	2	3	4	5	6	7	8	9	10
		The amount of income tax to be withheld is—										
$0	$55	0	0	0	0	0	0	0	0	0	0	0
55	60	1	0	0	0	0	0	0	0	0	0	0
60	65	2	0	0	0	0	0	0	0	0	0	0
65	70	3	0	0	0	0	0	0	0	0	0	0
70	75	3	0	0	0	0	0	0	0	0	0	0
75	80	4	0	0	0	0	0	0	0	0	0	0
80	85	5	0	0	0	0	0	0	0	0	0	0
85	90	6	0	0	0	0	0	0	0	0	0	0
90	95	6	0	0	0	0	0	0	0	0	0	0
95	100	7	0	0	0	0	0	0	0	0	0	0
100	105	8	1	0	0	0	0	0	0	0	0	0
105	110	9	1	0	0	0	0	0	0	0	0	0
110	115	9	2	0	0	0	0	0	0	0	0	0
115	120	10	3	0	0	0	0	0	0	0	0	0
120	125	11	4	0	0	0	0	0	0	0	0	0
125	130	12	4	0	0	0	0	0	0	0	0	0
130	135	12	5	0	0	0	0	0	0	0	0	0
135	140	13	6	0	0	0	0	0	0	0	0	0
140	145	14	7	0	0	0	0	0	0	0	0	0
145	150	15	7	0	0	0	0	0	0	0	0	0
150	155	15	8	1	0	0	0	0	0	0	0	0
155	160	16	9	2	0	0	0	0	0	0	0	0
160	165	17	10	2	0	0	0	0	0	0	0	0
165	170	18	10	3	0	0	0	0	0	0	0	0
170	175	18	11	4	0	0	0	0	0	0	0	0
175	180	19	12	5	0	0	0	0	0	0	0	0
180	185	20	13	5	0	0	0	0	0	0	0	0
185	190	21	13	6	0	0	0	0	0	0	0	0
190	195	21	14	7	0	0	0	0	0	0	0	0
195	200	22	15	8	0	0	0	0	0	0	0	0
200	210	23	16	9	2	0	0	0	0	0	0	0
210	220	25	18	10	3	0	0	0	0	0	0	0
220	230	26	19	12	5	0	0	0	0	0	0	0
230	240	28	21	13	6	0	0	0	0	0	0	0
240	250	29	22	15	8	0	0	0	0	0	0	0
250	260	31	24	16	9	2	0	0	0	0	0	0
260	270	32	25	18	11	3	0	0	0	0	0	0
270	280	34	27	19	12	5	0	0	0	0	0	0
280	290	35	28	21	14	6	0	0	0	0	0	0
290	300	37	30	22	15	8	1	0	0	0	0	0
300	310	38	31	24	17	9	2	0	0	0	0	0
310	320	40	33	25	18	11	4	0	0	0	0	0
320	330	41	34	27	20	12	5	0	0	0	0	0
330	340	43	36	28	21	14	7	0	0	0	0	0
340	350	44	37	30	23	15	8	1	0	0	0	0
350	360	46	39	31	24	17	10	2	0	0	0	0
360	370	47	40	33	26	18	11	4	0	0	0	0
370	380	49	42	34	27	20	13	5	0	0	0	0
380	390	50	43	36	29	21	14	7	0	0	0	0
390	400	52	45	37	30	23	16	8	1	0	0	0
400	410	53	46	39	32	24	17	10	3	0	0	0
410	420	55	48	40	33	26	19	11	4	0	0	0
420	430	56	49	42	35	27	20	13	6	0	0	0
430	440	58	51	43	36	29	22	14	7	0	0	0
440	450	59	52	45	38	30	23	16	9	2	0	0
450	460	61	54	46	39	32	25	17	10	3	0	0
460	470	62	55	48	41	33	26	19	12	5	0	0
470	480	64	57	49	42	35	28	20	13	6	0	0
480	490	66	58	51	44	36	29	22	15	8	0	0
490	500	69	60	52	45	38	31	23	16	9	2	0
500	510	72	61	54	47	39	32	25	18	11	3	0
510	520	75	63	55	48	41	34	26	19	12	5	0
520	530	78	64	57	50	42	35	28	21	14	6	0
530	540	80	67	58	51	44	37	29	22	15	8	1
540	550	83	70	60	53	45	38	31	24	17	9	2
550	560	86	73	61	54	47	40	32	25	18	11	4
560	570	89	75	63	56	48	41	34	27	20	12	5
570	580	92	78	65	57	50	43	35	28	21	14	7
580	590	94	81	68	59	51	44	37	30	23	15	8
590	600	97	84	70	60	53	46	38	31	24	17	10

MARRIED Persons—**WEEKLY** Payroll Period

(For Wages Paid in 1995)

If the wages are–		And the number of withholding allowances claimed is—										
At least	But less than	0	1	2	3	4	5	6	7	8	9	10
		The amount of income tax to be withheld is—										
$0	$125	0	0	0	0	0	0	0	0	0	0	0
125	130	1	0	0	0	0	0	0	0	0	0	0
130	135	1	0	0	0	0	0	0	0	0	0	0
135	140	2	0	0	0	0	0	0	0	0	0	0
140	145	3	0	0	0	0	0	0	0	0	0	0
145	150	4	0	0	0	0	0	0	0	0	0	0
150	155	4	0	0	0	0	0	0	0	0	0	0
155	160	5	0	0	0	0	0	0	0	0	0	0
160	165	6	0	0	0	0	0	0	0	0	0	0
165	170	7	0	0	0	0	0	0	0	0	0	0
170	175	7	0	0	0	0	0	0	0	0	0	0
175	180	8	1	0	0	0	0	0	0	0	0	0
180	185	9	2	0	0	0	0	0	0	0	0	0
185	190	10	2	0	0	0	0	0	0	0	0	0
190	195	10	3	0	0	0	0	0	0	0	0	0
195	200	11	4	0	0	0	0	0	0	0	0	0
200	210	12	5	0	0	0	0	0	0	0	0	0
210	220	14	7	0	0	0	0	0	0	0	0	0
220	230	15	8	1	0	0	0	0	0	0	0	0
230	240	17	10	2	0	0	0	0	0	0	0	0
240	250	18	11	4	0	0	0	0	0	0	0	0
250	260	20	13	5	0	0	0	0	0	0	0	0
260	270	21	14	7	0	0	0	0	0	0	0	0
270	280	23	16	8	1	0	0	0	0	0	0	0
280	290	24	17	10	3	0	0	0	0	0	0	0
290	300	26	19	11	4	0	0	0	0	0	0	0
300	310	27	20	13	6	0	0	0	0	0	0	0
310	320	29	22	14	7	0	0	0	0	0	0	0
320	330	30	23	16	9	1	0	0	0	0	0	0
330	340	32	25	17	10	3	0	0	0	0	0	0
340	350	33	26	19	12	4	0	0	0	0	0	0
350	360	35	28	20	13	6	0	0	0	0	0	0
360	370	36	29	22	15	7	0	0	0	0	0	0
370	380	38	31	23	16	9	2	0	0	0	0	0
380	390	39	32	25	18	10	3	0	0	0	0	0
390	400	41	34	26	19	12	5	0	0	0	0	0
400	410	42	35	28	21	13	6	0	0	0	0	0
410	420	44	37	29	22	15	8	1	0	0	0	0
420	430	45	38	31	24	16	9	2	0	0	0	0
430	440	47	40	32	25	18	11	4	0	0	0	0
440	450	48	41	34	27	19	12	5	0	0	0	0
450	460	50	43	35	28	21	14	7	0	0	0	0
460	470	51	44	37	30	22	15	8	1	0	0	0
470	480	53	46	38	31	24	17	10	2	0	0	0
480	490	54	47	40	33	25	18	11	4	0	0	0
490	500	56	49	41	34	27	20	13	5	0	0	0
500	510	57	50	43	36	28	21	14	7	0	0	0
510	520	59	52	44	37	30	23	16	8	1	0	0
520	530	60	53	46	39	31	24	17	10	3	0	0
530	540	62	55	47	40	33	26	19	11	4	0	0
540	550	63	56	49	42	34	27	20	13	6	0	0
550	560	65	58	50	43	36	29	22	14	7	0	0
560	570	66	59	52	45	37	30	23	16	9	1	0
570	580	68	61	53	46	39	32	25	17	10	3	0
580	590	69	62	55	48	40	33	26	19	12	4	0
590	600	71	64	56	49	42	35	28	20	13	6	0
600	610	72	65	58	51	43	36	29	22	15	7	0
610	620	74	67	59	52	45	38	31	23	16	9	2
620	630	75	68	61	54	46	39	32	25	18	10	3
630	640	77	70	62	55	48	41	34	26	19	12	5
640	650	78	71	64	57	49	42	35	28	21	13	6
650	660	80	73	65	58	51	44	37	29	22	15	8
660	670	81	74	67	60	52	45	38	31	24	16	9
670	680	83	76	68	61	54	47	40	32	25	18	11
680	690	84	77	70	63	55	48	41	34	27	19	12
690	700	86	79	71	64	57	50	43	35	28	21	14
700	710	87	80	73	66	58	51	44	37	30	22	15
710	720	89	82	74	67	60	53	46	38	31	24	17
720	730	90	83	76	69	61	54	47	40	33	25	18
730	740	92	85	77	70	63	56	49	41	34	27	20

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PAYROLL PERIOD

IF THE WAGES ARE –		AND THE NUMBER OF EXEMPTIONS CLAIMED IS–										
AT LEAST	BUT LESS THAN	0	1	2	3	4	5	6	7	8	9	10 or More
		THE AMOUNT OF TAX TO BE WITHHELD SHALL BE										
105	110	2.57	2.18	1.80	1.41	1.03	0.64	0.26				
110	115	2.82	2.43	2.05	1.66	1.28	0.89	0.51	0.12			
115	120	3.07	2.68	2.30	1.91	1.53	1.14	0.76	0.37			
120	125	3.32	2.93	2.55	2.16	1.78	1.39	1.01	0.62	0.24		
125	130	3.57	3.18	2.80	2.41	2.03	1.64	1.26	0.87	0.49	0.11	
130	135	3.82	3.43	3.05	2.66	2.28	1.89	1.51	1.12	0.74	0.36	
135	140	4.07	3.68	3.30	2.91	2.53	2.14	1.76	1.37	0.99	0.61	0.22
140	145	4.32	3.93	3.55	3.16	2.78	2.39	2.01	1.62	1.24	0.86	0.47
145	150	4.57	4.18	3.80	3.41	3.03	2.64	2.26	1.87	1.49	1.11	0.72
150	155	4.82	4.43	4.05	3.66	3.28	2.89	2.51	2.12	1.74	1.36	0.97
155	160	5.07	4.68	4.30	3.91	3.53	3.14	2.76	2.37	1.99	1.61	1.22
160	165	5.32	4.93	4.55	4.16	3.78	3.39	3.01	2.62	2.24	1.86	1.47
165	170	5.60	5.22	4.83	4.45	4.06	3.68	3.30	2.91	2.53	2.14	1.76
170	175	5.90	5.52	5.13	4.75	4.36	3.98	3.60	3.21	2.83	2.44	2.06
175	180	6.20	5.82	5.43	5.05	4.66	4.28	3.90	3.51	3.13	2.74	2.36
180	185	6.50	6.12	5.73	5.35	4.96	4.58	4.20	3.81	3.43	3.04	2.66
185	190	6.80	6.42	6.03	5.65	5.26	4.88	4.50	4.11	3.73	3.34	2.96
190	195	7.10	6.72	6.33	5.95	5.56	5.18	4.80	4.41	4.03	3.64	3.26
195	200	7.40	7.02	6.63	6.25	5.86	5.48	5.10	4.71	4.33	3.94	3.56
200	205	7.70	7.32	6.93	6.55	6.16	5.78	5.40	5.01	4.63	4.24	3.86
205	210	8.00	7.62	7.23	6.85	6.46	6.08	5.70	5.31	4.93	4.54	4.16
210	215	8.30	7.92	7.53	7.15	6.76	6.38	6.00	5.61	5.23	4.84	4.46
215	220	8.60	8.22	7.83	7.45	7.06	6.68	6.30	5.91	5.53	5.14	4.76
220	225	8.90	8.52	8.13	7.75	7.36	6.98	6.60	6.21	5.83	5.44	5.06
25	230	9.20	8.82	8.43	8.05	7.66	7.28	6.90	6.51	6.13	5.74	5.36
230	235	9.50	9.12	8.73	8.35	7.96	7.58	7.20	6.81	6.43	6.04	5.66
235	240	9.80	9.42	9.03	8.65	8.26	7.88	7.50	7.11	6.73	6.34	5.96
240	245	10.10	9.72	9.33	8.95	8.56	8.18	7.80	7.41	7.03	6.64	6.26
245	250	10.40	10.02	9.63	9.25	8.86	8.48	8.10	7.71	7.33	6.94	6.56
250	255	10.70	10.32	9.93	9.55	9.16	8.78	8.40	8.01	7.63	7.24	6.86
255	260	11.00	10.62	10.23	9.85	9.46	9.08	8.70	8.31	7.93	7.54	7.16
260	265	11.30	10.92	10.53	10.15	9.76	9.38	9.00	8.61	8.23	7.84	7.46
265	270	11.60	11.22	10.83	10.45	10.06	9.68	9.30	8.91	8.53	8.14	7.76
270	275	11.90	11.52	11.13	10.75	10.36	9.98	9.60	9.21	8.83	8.44	8.06
275	280	12.20	11.82	11.43	11.05	10.66	10.28	9.90	9.51	9.13	8.74	8.36
280	285	12.50	12.12	11.73	11.35	10.96	10.58	10.20	9.81	9.43	9.04	8.66
285	290	12.80	12.42	12.03	11.65	11.26	10.88	10.50	10.11	9.73	9.34	8.96
290	295	13.10	12.72	12.33	11.95	11.56	11.18	10.80	10.41	10.03	9.64	9.26
295	300	13.40	13.02	12.63	12.25	11.86	11.48	11.10	10.71	10.33	9.94	9.56
300	310	14.00	13.62	13.23	12.85	12.46	12.08	11.70	11.31	10.93	10.54	10.16

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Payroll Deductions

A	B	C	D	E	F	G	H	I
Hours Per Week	Hourly Rate	Gross	SS 6.2%	Medi-C 1.45%	Fed.	Ky. W	OCC 2.2%	Net

Project Future
Competency Area 2.0: Mathematics

Competency Number 2.5:	Measurement
Lesson Number 2.5.1:	Read and Interpret English and Metric Linear Measuring Instruments
Lesson Objective:	Using a vernier caliper, a micrometer, a ruler, and a tape measure with English and metric scale, the trainee will work with a team to complete a exercise of 20 problems that require measurements be made and recorded on the form provided. Using a conversion table, the trainee will correctly answer 7 of 10 problems that require the conversion of English to metric or metric to English measurements.
Prerequisite Skill:	The trainee must be able to compute whole numbers, decimals, and fractions.
Literacy Skills:	Trainee will accurately record whole numbers, fractions, and decimals. Trainee will prepare a table of measurements. Trainee will demonstrate understanding of relationships between English and metric measurements and weights. Trainee will convert English to metric measurements and metric to English measurements.

Presentation:

I. Prior to class, the trainer will acquire a yardstick, a ruler, and a tape measure that shows both English and metric scales. The trainer will also obtain a vernier caliper, a micrometer, and a set of drop-peg measuring devices. The trainer will also obtain samples of at least 20 products from the production floor and two small prizes such as pieces of fruit or candy. The trainer will also measure the length of the room and will record the measurement in both English and metric figures.

II. The trainer will introduce the lesson by asking the trainees to write on a sheet of paper their guesses as to how long the room is. They are to write their guess in English measurement terms and also in metric measurement terms. The trainer will select two trainees to use the tape measure to measure the distance. The trainer writes it on the board. The closest guess in each category wins a small prize.

III. The trainer will explain that the two measurements are equal. This lesson is about linear measure. Linear measure is the measurement of straight-line distance between two points, lines, or surfaces. The trainer will demonstrate the uses of the measuring devices by measuring various areas of one of the parts collected before class. The trainer will give measurements in both English and metric terms when possible.

IV. Using the information in the handout, Using Measuring Tools and Instruments as a reference, the trainees break into groups of three to complete the exercise, Measuring, Your Success!

Evaluation: Using a conversion table, the trainee will correctly answer seven of 10 problems that require the conversion of English to metric or metric to English measurements.

Extension Activity: The trainees will work in teams to design a new break room that incorporates the current area plus 50percent more space for a smoking area. The trainees will use graph paper to scale the drawings. The trainees will need to use most of the measuring instruments to measure the fixtures (microwave, tables, soft drink machines) before drawing the plans. The trainees will present their ideas to the large group.

Using Measuring Tools and Instruments

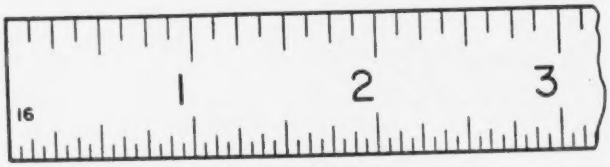
The careful use of measurement tools is critical. The types of tools used in production must be accurate. Do not bend, twirl, or subject them to harsh temperatures or treatment. Store the tools in clean, protected areas.

Rules and Tape Measures

All rules and tape measures are divided into evenly spaced divisions. It is important to be sure of the number of divisions between zero and one. Most rules used in production will measure at least to 1/64th of an inch. Precise measurements are critical when designing tools and molds, and when molding parts that will be interconnected with other pieces.

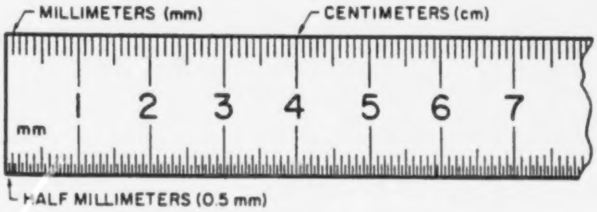
Rules may be divided into either inches or into metric measures--millimeters and centimeters.

The rule below is an inch rule. It shows a division of 1/8ths per inch on the top scale. Notice that there are eight small marks between each full inch. Notice that the bottom shows a division of sixteen small marks between each full inch. This is a 1/16ths inch measure.



FRACTIONAL INCH

Rules and tape measures come in different lengths. They may be as short as six inches or as long as 100 feet.
The following metric rule shows a division of ten small marks between each of the whole numbers. The smaller marks are millimeters, and the larger whole numbers are centimeters.

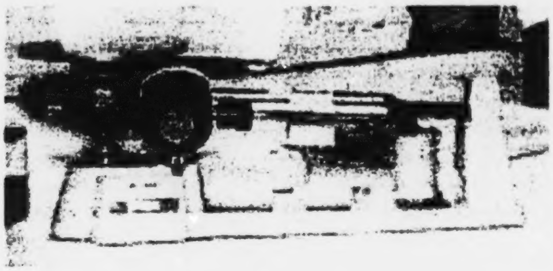


METRIC

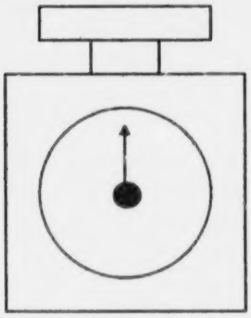
Scales

The tools pictured below are scales. Scales are used to measure weights of objects.

The English scale measures in units of ounces and pounds. The metric scale is most often used in the production of plastic parts. It weighs in units of grams and centigrams. Metrics allow for more minute measurements of weight. Scales are limited to being able to weight a certain amount. For example, scales used to measure small objects such as letters may only be able to weigh 10 pounds. While other scales designed to weigh shipments may weigh 10 tons.



Standard Metric Scale
measures in centigrams and grams

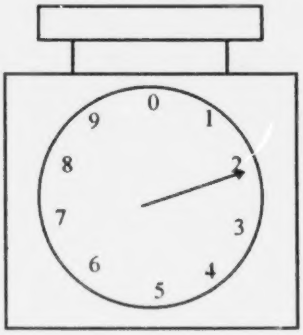


English Scale
measures in ounces and pounds

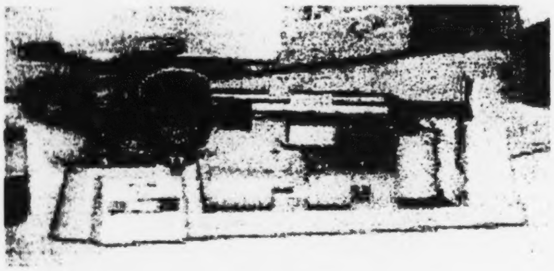
To use the scale to weigh parts, use a know weight to be sure the scale is calibrated correctly. This means that the scale has been set to accurately weigh objects.

On most English scales read the whole numbers first. These are the pounds. Count each small mark between the whole numbers. These are the ounces.

The scale below shows 2 pounds and 3 ounces. This could be abbreviated at 2 lb. 3 oz.

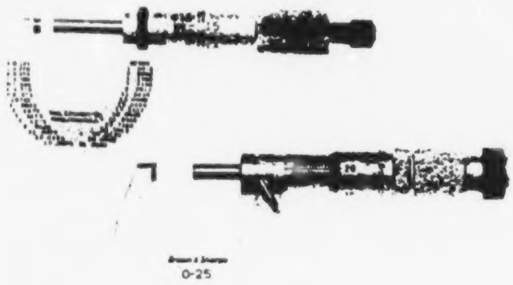


The scale below is a metric scale.

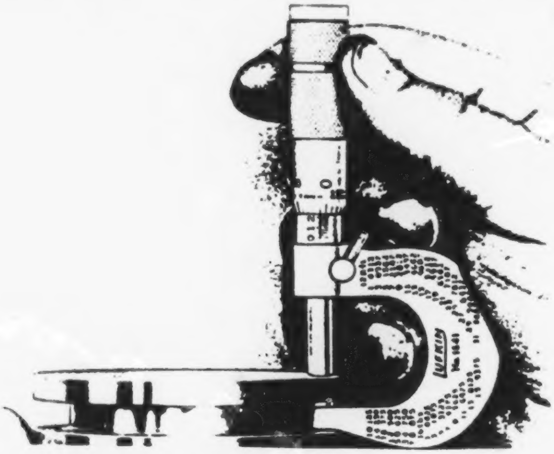


Micrometer Calipers

The measuring instrument pictured below is a micrometer caliper. It is most often simply called a micrometer. It is used to measure tools and parts which must be measured in small units to a high degree of accuracy. A micrometer may be marked to 1/1000 or .001 of an inch. They come in a variety of sizes. Study any micrometer and its manual before using it. You may need to ask your supervisor to help you at first. It is better to ask than to make a serious and costly error.

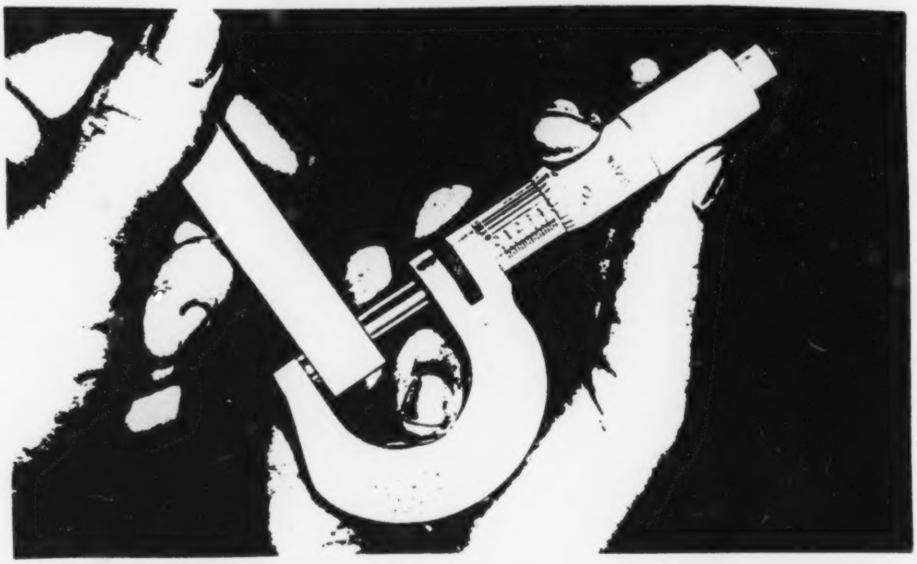


An outside micrometer measures external diameters and thicknesses.



The inside micrometer measures internal diameters of cylinders and rings, widths of slots, setting gages, etc.

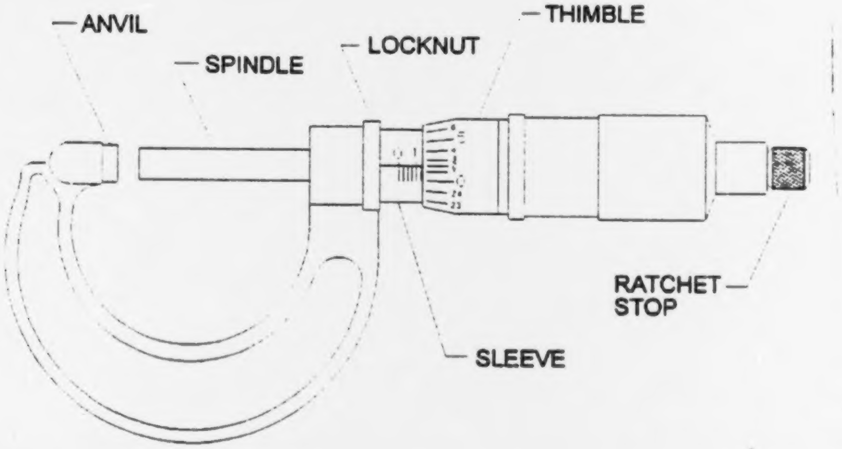
To read a micrometer, hold it as illustrated below. Use your thumb and forefinger to turn the gage.



Never, ever twirl the handle of the tool with your hand to open or close it. Doing so will destroy the accuracy of the tool.

Reading An Inch-Based Micrometer Caliper

Study the micrometer caliper pictured below. You will need to know the parts in order to learn to read the inch-based micrometer.

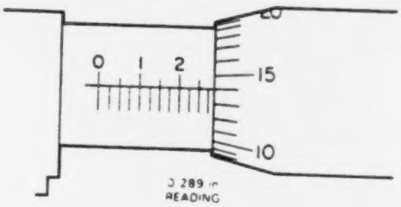


The line engraved lengthwise on the sleeve is divided into 40 equal parts per inch. Each whole number on the sleeve is equal to .100 of an inch. Each vertical line equals 1/40 or 0.025 inches.

The lines engrave around the thimble of the micrometer is divided into 20 space with each 5 spaces being notated for ease in reading. Notice that there are 5 smaller lines between each noted number. Each space is counted when reading the micrometer. Each space is equal to .001 inches.

Study the examples below:

Micrometer example 1:



0.289 in
READING

The reading is:
2 large graduations or 2 x .100 = .200
3 small graduations or 3 x .025 = .075
and 14 graduations on the thimble
Or 14 x .001 = .014
Add all numbers = .289 in.

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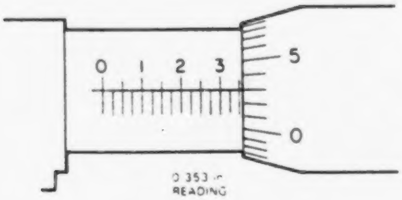
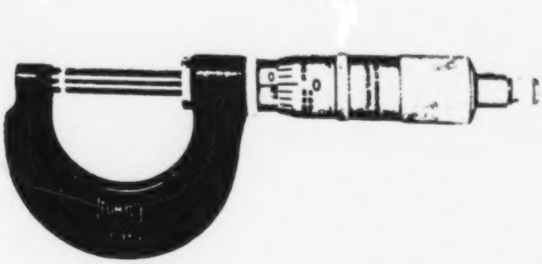
Micrometer example 2:


0
1
2
3
5
0
0.353 in
READING

The reading is:
2 large graduations or 3 x .100 = .300
3 small graduations or 2 x .025 = .050
and 3 graduations on the thimble
0r 3 x .001 = .003
Add all numbers = .353 in.

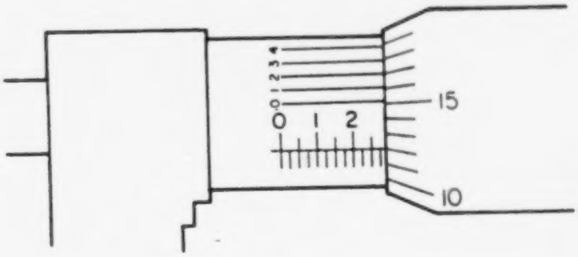
Reading a Vernier Micrometer

When it is necessary to measure finer than 1/1000th of an inch, the Vernier micrometer is used. This micrometer has a third scale around the sleeve that will furnish the 1/10,000 (.0001) reading without estimating or guessing. The Vernier scale has 11 parallel lines that occupy the same space as 10 lines on the thimble. The lines around the sleeve are numbered 1 to 10. The difference between the spaces on the sleeve and those on the thimble is one-tenth of a thousandth of an inch.



To read a Vernier scale, first read the thousandths reading, then see which line on the Vernier scale lines up with a line on the thimble. Only one can line up. If the line is 1, add .0001 to the reading. If the line is 2, add .0002 to the reading.

Vernier reading example:



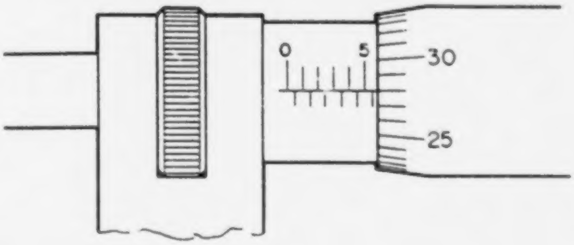
2 large graduations or 2 x .100 = .200
3 small graduations or 3 x .025 = .075
12 graduations on the thimble
Or 14 x .001 = .012
the 2 is the only line that lines up
with a number on the thimble
so 2 x .0001 = .0002

Add all numbers together = .2872 in

Reading a Metric Based Micrometer

To read a metric micrometer, add the total reading in millimeters visible on the sleeve to the reading of hundredths of a millimeter, indicated by the graduation on the thimble. See how the thimble reading coincides with the longitudinal line on the micrometer sleeve.

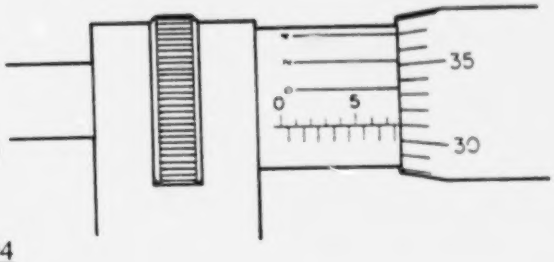
Metric micrometer reading example:



5 large graduations on barrel = 5.00
1 small graduations on barrel under
the whole mm line = .50
28 small graduations thimble = .28
Add all numbers together = 5.78 mm

To read a metric based Vernier micrometer:

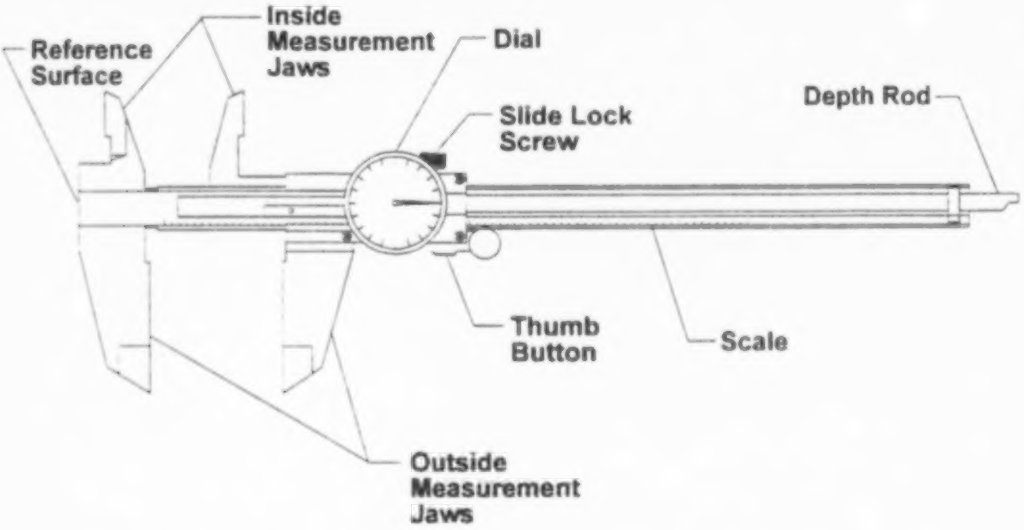
Read the same as the example above and add the number that coincides with a line on the thimble. (Note: this is the same method as using the Vernier scale on the inch-based micrometer.)



5 large graduations on barrel = 5.00
1 small graduations on barrel under
the whole mm line = .50
28 small graduations thimble = .28
The 4 lines up with a number on the
thimble = .004
Add all numbers together = 5.784 mm

The Vernier Caliper

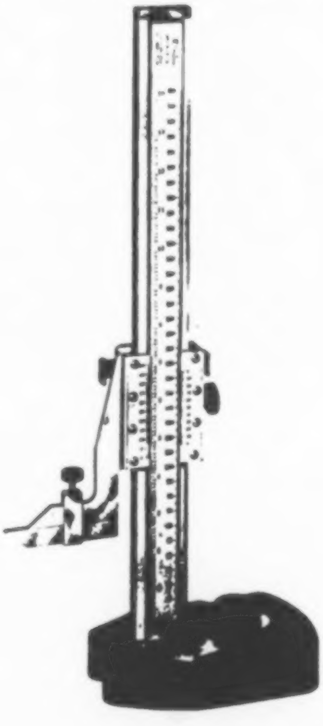
The Vernier caliper, unlike the micrometer caliper, can make both inside and outside measurements. Because of this it can make measurements over a large range of sizes. It is made as a standard item in 6 in., 12 in., 24 in., 36 in., and 48 in. lengths. The metric Vernier caliper is made in 150 mm, 300 mm, and 600 mm lengths. The 6 in. and 12 in. and 150 mm and 300 mm sizes are the most commonly used.


Reference Surface
Inside Measurement Jaws
Dial
Slide Lock Screw
Depth Rod
Thumb Button
Scale
Outside Measurement Jaws

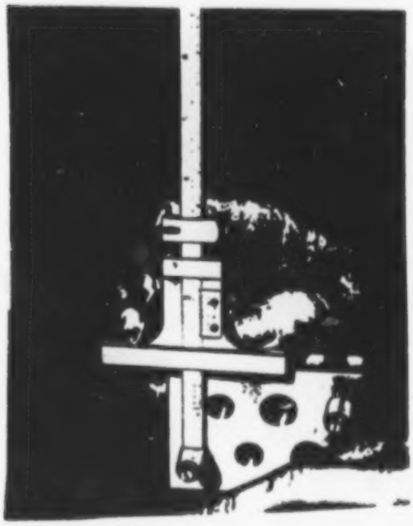
The Vernier caliper can make accurate measurement to 1/1000 (.001) in. and 1/50 or 2/100 (.02) mm.

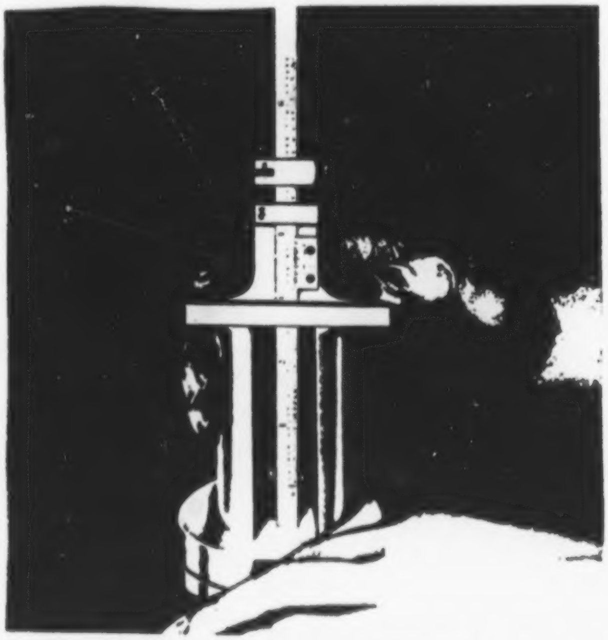
Other Vernier Tools

The Vernier height gage is made to use
in tool rooms and in quality inspection departments.
It is pictured at the right.

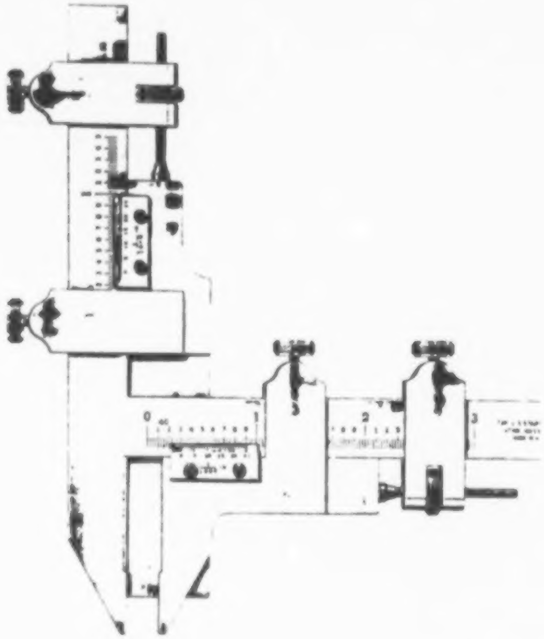


The Vernier depth gage is ideal for measuring the depth of holes, slots, and recessses.





The gear tooth Vernier caliper is needed to measure gear teeth, form and thread tools. In plastics manufacturing it is used mainly in the repair of machinery and in the making of tools and molds.



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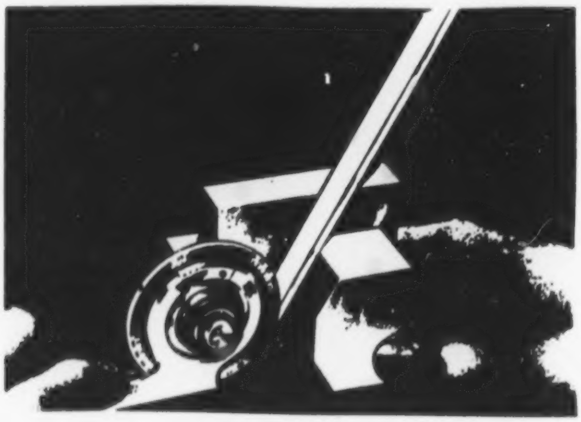
A universal Vernier bevel protractor is designed for the precise layout and measurement of angles. It measures angles in degrees, minutes, and seconds.



Vernier measuring tools, with the exception of the bevel protractor, consist of a graduated beam with fixed jaw, and a Vernier slide assembly. The Vernier slide assembly is composed of a movable jaw or scribe, Vernier plate, and clamping screws. The slide moves as a unit along the beam.

The beam of the Vernier caliper is graduated on both sides. One side is for making OUTSIDE measurements, the other side is for making INSIDE measurements.

Many of the Vernier measuring tools are graduated to make both inch and millimeter measurements.

25 Division Vernier reading example:

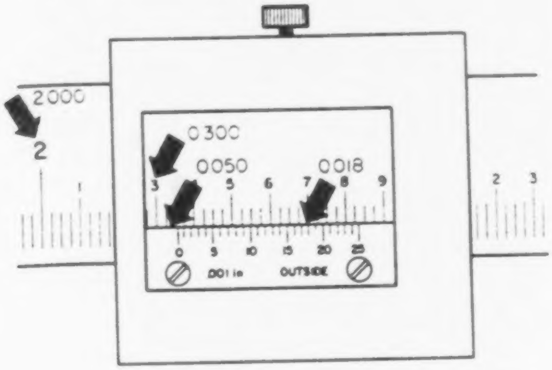
Every inch section on the beam of measuring tools using the 25 division Vernier plate is graduated into forty equal parts. Each graduation is 1/40 or .025 inches. Each graduation is 1/40 or .025. Every fourth division, representing 1/10 or .100 inch, is numbered.

There are 25 divisions on the Vernier plate. Every fifth line is numbered: 5, 10, 15, 20, and 25. The 25 divisions occupy the same space as 24 divisions on the beam. This slight difference, equal to .001 (1/1000) in. per division, is the basis of the Vernier principle of measuring.

To read a 25 division Vernier plate measuring tool, note how many inches (1,2,3, etc.), tenths (.100, .200, .300, etc.), and fortieths (.025, .050, .075) there are between the "0" on the Vernier scale and the "0" line on the beam; then add them together.

Now count the number of graduations (each one equals .001 or 1/1000 in.) that lie between the "0" line on the Vernier plate and the line that coincides (corresponds exactly) with a line on the beam. Only one line will coincide. Add this to the above total for the reading.

Look at the example below.



The reading is made up of:

The "0" line on the Vernier plate is between 2 and 3 on the beam	=	2.000
Add three .100 graduations	=	.300
Add two .025 graduations	=	.050
Add eighteen .001 graduations	=	.018
Total reading		2.368

50 Division Vernier reading example:

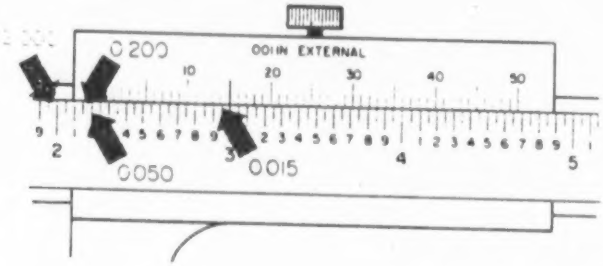
On the 50 division Vernier plate, every second graduation between the inch lines is numbered, and equals .100 in. The unnumbered graduations equal .050 in.

The Vernier plate is graduated into 50 parts, each representing .001 in. Every fifth line is numbered: 5, 10, 15, 20, 25, 30, 35, 40, 45, and 50.

To read a 50 division Vernier measuring tool, first count how many inches, tenths (.100), twentieths (.050) there are between the "0" line on the beam, and the "0" line on the Vernier plate. Then add them.

Next, count the number of .001 graduations on the Vernier plate from its "0" line to the line that coincides with a line on the beam. Add this to the others. that is the reading.

Look at the example below.

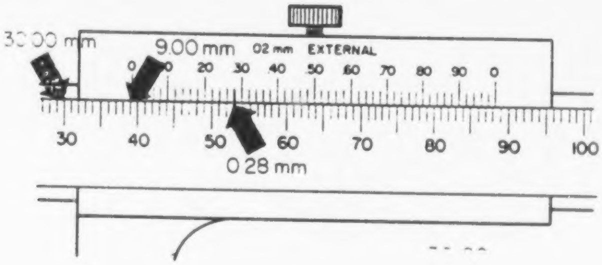


The reading is made up of:

The "0" line on the Vernier plate is between 2 and 3 on the beam	=	2.000	
Add two .100 graduations	=		.200
Add one .050 graduation	=		.050
Add fifteen .001 graduations	=	.015	
Total reading	=		2.265 in.

Reading a Metric-based Vernier Scale

The same principles are used in reading metric Vernier measuring tools as those for English measure. However, the readings on the Vernier scale are obtained in .02 mm. Look at the example below.



The reading is made up of:

The "0" line on the Vernier plate is
between 30 and 40 on the beam = 30.00
Add nine mm = 9.00
Add .28 for the bottom scale = .28
Total reading = 39.28

Other Types Of Calipers

Electronic digital readout calipers are direct reading, and may be changeable to either inch or metric measure.

Dial calipers can be used to make outside, inside, and depth measurements. The dial reads directly to .001 in. or .02 mm and is easily adjustable for setting. A lock permits the tool to be used for repeat measurement of the same part.

Gages

Drop Gages

Drop gages are designed to fit a particular size. The size is generally engraved on the side of the gage. Most gages have two different measurements--one on each end. The gage is "dropped" into the crevice or hole which is intended to be measured. The quality instructions will tell whether the pin is to drop through cleanly or drop to a certain depth.

Air Gages

Air gages use air pressure to measure hole sizes. Change in air pressure is measured by a dial type indicator.

Electronic Gages

Electronic gages are comparison gages and must be calibrated with master gauge blocks.

Laser Gages

The laser uses a very narrow beam of very intense light to take measurements and inspect parts.

Optical Comparator

The optical comparator used magnification as a means for production inspection. An enlarged image of the part is projected upon a screen for inspection. The part image is superimposed upon an enlarged accurate drawing of the correct specifications. The comparison is made visually.

Optical Flats

Optical flats are precise measuring instruments that use light waves as a measuring standard. The flats are made of quartz with one face ground and polished to optical flatness. When this face is placed on a milled surface and a special light passed through it, light bands appear on the surface. The shapje of these bands indicate to the inspector the accuracy of the measurement in very small parts of an inch.

Measuring Your Success

1. Using the tape measure provided, measure the length and the width of the room.

   Length = ____________ Width = ____________

2. Using the Vernier caliper, measure the depth of the cavity labeled A.
   Record your result here ____________________

3. Using the English scale weigh the part labeled GG.
   Record your result here ____________________

4. Using the metric scale weigh the part labeled GG.
   Record your result here ____________________

5. Using the micrometer, measure the thickness of the portions of part BB where the arrows point. Record your result here ____________________

6. Using the metric rule provided, take the outside dimensions of the part labeled AA.
   Record your result here ____________________

7. Using the height gage, record the height of the part labeled HH.
   Record your result here ____________________

8. Use the drop gage provided to answer this question. Does the larger end of the drop gage drop cleanly through the hole on the part labeled CC?
   Yes _____ No _____

9. Use the metric rule to answer the following question.
   Which is longer the part labeled CC or the part labeled HH?
   Circle the correct answer and record each parts length.
   CC ___________ long HH ___________ long

10. Use the metric scale to weigh part BB.
    Record your result here ____________________

Using Tables To Convert English And Metric Measurements

Using the table provided convert the following measurements:

From:	To:
1 inch	____________feet
1 foot	____________inches
1 inch	____________yards
1 yard	____________inches
1 foot	____________yards
1 yard	____________feet
1 mile	____________yards
1 mile	____________feet
1 centimeter	____________inches
1 inch	____________centimeters
1 millimeter	____________inches
1 inch	____________millimeters
1 ounce	____________grams
1 gram	____________ounces
16 ounces	____________grams
1 pound	____________grams
1 gram	____________pounds
1 pound	____________kilograms
1 kilogram	____________pounds

From:	To:
1 ounce	____________kilograms
1 kilogram	____________ounces
1 ounce	____________pounds
1 pound	____________ounces
1 square foot	____________square inches
1 square inch	____________square feet
1 square yard	____________square feet
1 square foot	____________square yards
1 square centimeter	____________square inches
1 square inch	____________square centimeters
1 square inch	____________square millimeters
1 square millimeter	____________square inches
1 cubic centimeter	____________cubic inches
1 cubic inch	____________cubic centimeters
1 cubic centimeter	____________cubic inches
1 cubic inch	____________cubic centimeters
1 cubic millimeter	____________cubic inches
1 gallon	____________liters
1 liter	____________gallons
1 degree C (Celsius)	____________degrees F
1 degree F (Fahrenheit)	____________1 degree C

Measurement Conversion Tables

Length Conversions

To Convert From	To	Multiply By
Inches	Feet	12
Feet	Inches	.0833
Inches	Yards	36
Yards	Inches	.0278
Feet	Yards	3
Yards	Feet	.333
Yards	Miles	1760
Miles	Yards	.00057
Feet	Miles	5280
Miles	Feet	.00019
Yards	Miles	1760
Centimeters	Inches	.3937
Inches	Centimeters	2.54
Centimeter	Millimeter	.001
Millimeter	Inches	.03937
Inches	Millimeter	25.4

Weight Conversions

Ounces	Pounds	.0625
Pounds	Ounces	16
Ounces	Grams	28.35
Grams	Ounces	.0353
Pounds	Grams	454
Grams	Pounds	.0022
Pounds	Kilograms	.454
Kilograms	Pounds	2.205
Ounces	Kilograms	2.205
Kilograms	Ounces	35.274
Kilograms	Ounces	35.274

Area Conversions

To Convert From	To	Multiply By
Square Inches	Square Feet	.0069
Square Feet	Square Inches	144
Square Feet	Square Yards	9
Square Yards	Square Feet	.111
Square Centimeters	Square Inches	.155
Square Inches	Square Centimeters	6.4516
Square Inches	Square Millimeters	645.2
Square Millimeters	Square Inches	.0016

Volume Conversions

To Convert From	To	Multiply By
Cubing Inches	Cubic Feet	1728
Cubic Feet	Cubic Inches	.00058
Cubic Feet	Cubic Yards	27
Cubic Yards	Cubic Feet	.037
Cubic Centimeters	Cubic Inches	.061
Cubic Inches	Cubic Centimeters	16.387
Cubic Millimeters	Cubic Inches	.000061
Cups	Pints	2
Pints	Cups	.5
Pints	Quarts	2
Quarts	Pints	.5
Quarts	Gallons	4
Gallons	Quarts	.25
Gallons	Liters	3.785
Liters	Gallons	.22642

Temperature Formulas: °Celsius = .56 times (°F - 32)
°Fahrenheit = 1.8 (°C) + 32

Project Future
Competency Area 2.0: Mathematics

Competency Number 2.5: Measurement

Lesson Number 2.5.2: Read and Interpret Common English and Metric Weight Measuring Instruments.

Lesson Objective: Using an English scale and a triple beam metric scale, the trainee will weigh each of 10 parts from the production floor. He/she will accurately record the weights on the form provided.

Prerequisite Skills: The trainee must have a general understanding of decimal values, including place value.
The trainee must be able to multiply simple numbers.

Literacy Skills: Trainee will accurately record whole numbers and decimals.
Trainee will prepare a table of weights.
Trainee will understand approximate relationships between English and metric weights.
Trainee will understand calibrations of instruments.
Trainee will demonstrate ability to use English and triple-beam metric scales.

Presentation:

I. Prior to class, the trainer will weigh a quarter and a dime. The trainer will weigh the quarter using an English scale and will weigh the dime using a triple-beam metric scale. Without labeling the values, the trainer will record them on the board.

II. To introduce the comparison of English and metric values for the day, the trainer will select one of the class members with whom to work. The trainer will tell the trainee that he/she has something that the trainee will want. Based on the values written on the board, the trainee is to tell the trainer which one he/she would rather have.

III. Using the English scale, the trainer will demonstrate weighing a small article of a known weight, such as a soda. The trainer will record the weight on the board. Using the metric scale, the trainer will demonstrate weighing the same article on the triple-beam metric scale. The trainer will record the weight on the board.

Evaluation: The trainer will demonstrate how to check the calibration of the triple-beam metric scale by using the known weights. The trainees will use both the English scale and the triple-beam metric scales to weigh each of the 10 parts collected before class. The trainees will record the weights on the chart provided.

Extension Activity: The trainees will read nutrition labels on food products and will practice weighing serving sizes of various food products. Using the diet pyramid and the labels on the food, the trainees will plan a balanced meal. The trainees will use the scales to weigh the serving sizes of the foods for the meal.

Project Future
Competency Area 2.0: Mathematics

Competency Number 2.5:	Measurement
Lesson Number 2.5.3:	Read and Interpret Common English and Metric Liquid Measuring Instruments
Lesson Objective:	Using a set of English measuring containers and a set of metric measuring containers, the trainees will measure six liquids, using both types of containers.
Prerequisite Skills:	The trainee must be able to multiply and divide whole numbers. The trainee must be able to understand and compare fractions and decimals.
Literacy Skills:	Trainee will accurately record whole numbers and decimals. Trainee will be able to use metric and English measuring containers. Trainee will understand approximate relationships between English and Metric weights. Trainee will demonstrate teamwork and critical-thinking skills.

Presentation:

I. The trainees are instructed to solve a riddle.

> A terrorist is holding the company hostage. He has placed a pressure-sensitive plastic explosive under a five-gallon bucket. Within five minutes, your team of cracker-jack detonation experts must place exactly four gallons of water into the five-gallon bucket. You look everywhere and finally find a three-gallon bucket. Good luck! I am taking cover. You the trainees, will complete the exercise.
>
> (Answer: The trainees fill the three-gallon bucket twice and will pour it into the five-gallon bucket. On the second fill-up the five-gallon bucket will not hold the last gallon. Leave the one-gallon in the three-gallon bucket and pour out the five gallons. Pour the one gallon into the now empty five-gallon bucket and fill the three-gallon bucket one more time. When you add that 3 gallons of water to the one gallon in the five-gallon bucket, you have exactly four gallons of water and you have saved the company.)

II. The trainees complete the exercise, A Review of English Liquid Measurement.

III. The trainees complete the exercise, A Review of Metric Liquid Measurement.

Evaluation: Using the measuring containers provided, the trainees will measure each of the six liquids by using the English cups first and pouring the liquids into the metric cup that corresponds most closely in size.

Extension Activity: The trainees will break into two teams--English and metric. The teams will use the measuring containers to prepare a drink for the class.

Measurement Riddle – The Company IS Counting on You

A terrorist is holding the company hostage. He has placed a pressure-sensitive plastic explosive under a five-gallon bucket. Within five minutes, you team of cracker-jack detonation experts must place exactly four gallons of water into the five-gallon bucket. You look everywhere and finally find a three-gallon bucket. The clock is ticking.

Good luck! I am taking cover. You, the trainees, will complete this exercise.

A Review of Metric Liquid Measurement

See if you can complete this table by using the Review of English Liquid Measurement Table and the conversion factors listed below. Check your answers with the key.

To Convert From	To	Multiply By
Milliliters	**Fluid Ounces**	**.0338**
Fluid Ounces	**Milliliters**	**29.575**
Liters	**Gallons**	**0.2642**
Gallons	**Liters**	**3.785**

1 liter = ________________ cups

1 liter = ________________ ounces

1 liter = ________________ pints

1 milliliter = ____________ ounces

1 liter = ________________ quarts

1 milliliter = ____________ cups

1 liter = ________________ gallons

1 milliliter = ____________ gallons

Project Future
Competency Area 2.0: Mathematics

Competency Number 2.5: Measurement

Lesson Number 2.5.4: Compute Part Weight and Cost, Convert English and Metric Measurements.

Lesson Objective: The trainee will determine the weight and the cost of a part by using a formula to convert an English measurement to a metric measurement.

Prerequisite Skills: The trainee must be able to multiply and divide whole numbers and decimals.
The trainee must be able to read directions.

Literacy Skills: The trainee will demonstrate use of tables and flow charts.
The trainee will convert metric and English measurements.
Trainee will demonstrate understanding of the relationship between English and metric weights.
The trainee will demonstrate critical-thinking skills.
The trainee will use mixed mathematics operations to sole problems.
The trainee will use a formula to solve problems.

Presentation:

I. The trainer will introduce the lesson by placing two parts on the table--one part is a passable ("good") part; the other is a rejected ("bad") part, preferably a short shot. The trainer will ask the trainee which part costs the most. Some trainees may say that the short shot will cost the least because it contains less plastic. The trainer will lead the trainees in a discussion that will lead them to understand that the short cost is much more expensive. Use the Handout, Rejected Parts Cost--to explain what those costs are: lost man hours, lost machine hours, lost material, missed production deadlines, lost customer satisfaction, lost orders, lost jobs.

II. Trainer will demonstrate the computation of several part weights on the board. During the last two demonstrations, the trainer will have trainees tell him/her what to write leading trainees to explain ***why*** they are, telling him/her to write each step.

Evaluation: Trainees will complete the Exercise--Part Weight Math.

Extension Activity: Trainees will convert the measurements from the labels of canned food into either English or metric measurements. The trainees will plan an appropriate number of servings to meet the RDA, using the food pyramid.

REJECTED PARTS COST:

Lost Man Hours

Lost Machine Hours

Lost Material

Missed Production Deadlines

Lost Orders

Lost Jobs

Part Weight Math

Determining Part Cost And Converting English And Metric Measurements

An old saying goes, "Watch out for the pennies and the dollars will take care of themselves." A more modern business interpretation of this simple economic truth might be, "Watch out for the dollar and the hundreds of dollars will take care of themselves."

As you may have read, the plastics industry is one of the fastest growing industries in the **world.** This means that the competition for molding jobs is becoming more fierce. It means that the company with the **lowest price and**

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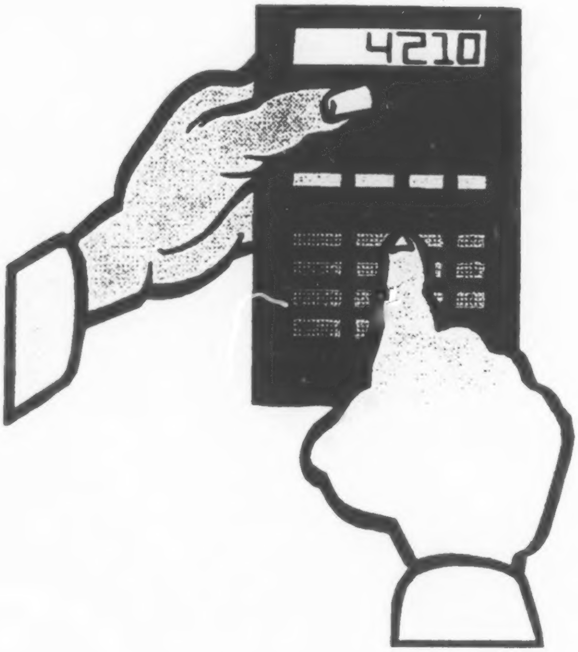
the highest quality is going to be awarded the business. It means that jobs must be quoted with little or no margin for error at the molding site.

But, what does that mean for you, the person responsible for meeting production requirements? It means that resource management and quality control must become more exact--there is little or no money figured into the quote for mistakes. And as the costs of materials and personnel continue to rise, these concerns become greater.

Let's look at some simple math problems that you will be required to do in order to answer tough questions about one of the most controllable parts of resource management, **part weight**. Depending on the cost of the material used for the job, a difference of a few grams can mean a huge dollar loss for the company.

The problems on the next pages will give you practice in computing part weights and determining their costs.



Part Weight Math

Determining Part Cost And Converting English And Metric Measurements

Futura quotes molding jobs in pounds of resin per 1000 parts, but when the quality control supervisor weighs the part, he/she weighs it in grams. How can you compare the two?

The term pound is one of the units of measurement found in the English measurement system. The term gram is one of the units of measurements found in the metric system. In order to compare pounds and grams, you must convert (or change) one of the terms to match the other term. A simple chart is attached to this unit which lists the most common measurements and their equivalents used in the plastics industry. It might be helpful to keep it posted in a prominent spot.

As you can see from the chart, to convert pounds to grams you must multiply the number of pounds by 454. Therefore, 10 pounds equals 4,540 grams.

Let's see how that works in an everyday Futura Problem.

Mr. Futura Salespro quoted Dover part # E450 at 4037.44 pounds per thousand parts. How many grams must each part weigh to stay at the quoted weight?

Write the problem out in "math speak". (The word "per" is almost always "math speak" for the division sign.)
4037.44 pounds ÷ 1000 parts = 4.03744 pounds per part

Now, you need to find out how many grams 4.03744 pounds is. From the table you know that each pound is equal to 454 grams. Write it in "math speak".
1 pound X 454 = 454 grams, so:
4.03744 pounds X 454 = 1832.9977 grams.

In order to make this decimal easier to live with, let's round it up to the nearest whole number. Remember when rounding, .5 or above goes to the next highest number, while anything less than .5 goes to the next lowest number.

The answer in this case is **1833 grams**. Each part must weigh 1833 grams to stay at the quoted weight. If the weight is higher, Futura loses some of the money they expected to make. If the weight is lower and the quality acceptable, Futura makes more money than they expected, and you look GOOD!

Now that we know what the weight of the part is we can figure the cost of each part. This will give us some idea of how important it is to keep the part weight at the quoted amount.

We know that the resin price fluctuates, but the current cost of the resin for Dover #E450 is $4.58 per pound.

Do you remember the weight of each part in pounds?

It was 4.037 pounds. To get the cost of resin for each part, you must multiply the weight of the part by the cost of the resin.

4.037 pounds (weight of the part)
X $4.58 (cost of the resin)
$18.489 (cost of the part)
(Remember we are not computing the weight or cost of the inserts, so the actual costs would be a bit different.)

The parts were quoted to weigh 1833 grams each. But what happens if the parts are run at a weight of 1850 grams? How much per part extra will it cost Futura?

1850 grams (the actual weight of the part you just weighed)
–1833 grams (the quoted weight)
17 grams.

The part weighs 17 grams too much.

Since we know that resin is sold by the pound, we will have to convert the grams to pounds to find out how much the extra weight costs Futura. From our last example, we saw that if we know the pounds, we can convert them to grams by multiplying by 454. This time we know the grams. We need to go in the opposite direction. So, we will do the opposite of multiply--divide! We will divide by 454.

17 grams ÷ 454 = .0374 pounds

The part is .0374 pounds over the quoted weight. But we still haven't answered the question. How much extra is this part costing?
.0374 pounds (the extra weight) X $4.58 (the cost of the resin) = $.17

Seventeen cents doesn't sound like much. But, let's take a look at a bigger picture.

If the shots per hour are 29.51, how much money will this cost your shift?
Of course, with you in charge, we are not going to worry about scrap in this problem.

29.51 (number of shots per hour)
X 8 (number of hours in a shift)
236.08 (shots per shift)

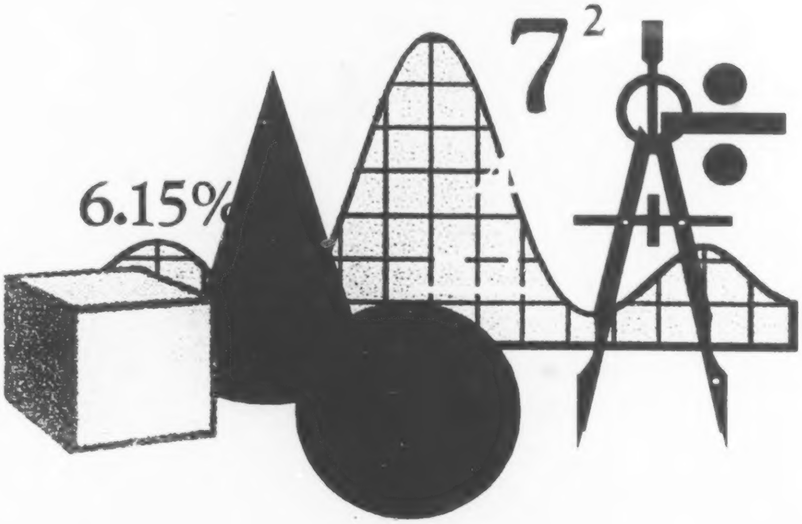
236.08 parts
X .17 cents (cost of overweight material)
$ 40.13 (per shift)

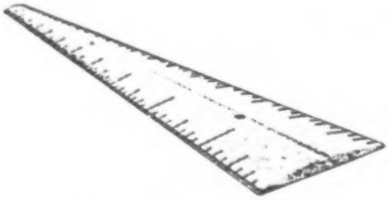
What if the parts ran this way on all shifts for a full week? How much would it cost Futura?

$ 40.13 (cost of overweight material per shift)
X 7(number of days in week)
$280.91(cost of overweight material per week for your shift)

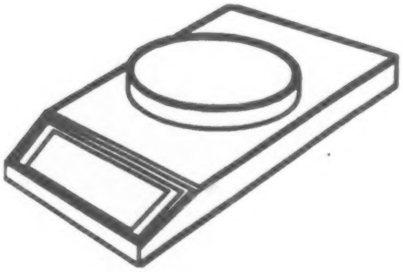
$280.91(cost of overweight material per week for each shift)
X 3 (number of shifts)
$842.73 (Futura's loss per week)

The following page contains some problems for practice. Please continue on.

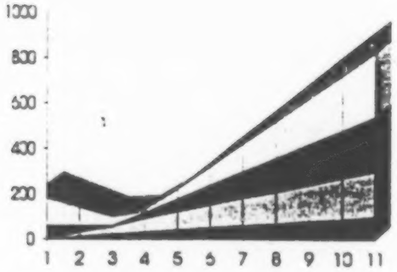




TO CONVERT FROM	***LENGTH CONVERSIONS TO***	***MULTIPLY BY***
CENTIMETERS(cm.)	INCHES(in.)	0.3937
INCHES	CENTIMETERS	2.54
MILLIMETERS(mm.)	INCHES	0.03937
INCHES	MILLIMETERS	25.4
MILLIMETERS	MILS	39.37
MILS	MILLIMETERS	0.0254



TO CONVERT FROM	***WEIGHT CONVERSIONS (MASS) TO***	***MULTIPLY BY***
OUNCES(oz.)	GRAMS(g.)	28.35
GRAMS	OUNCES	0.0353
POUNDS(lbs.)	GRAMS	454
GRAMS	POUNDS	0.0022
POUNDS	KILOGRAMS(kg.)	0.454
KILOGRAMS	POUNDS	2.205
OUNCES	KILOGRAMS	0.0284
KILOGRAMS	OUNCES	35.274
OUNCES	POUNDS	0.0625
POUNDS	OUNCES	16



TO CONVERT FROM	***AREA CONVERSIONS TO***	***MULTIPLY BY***
CENTIMETERS²	INCHES²	0.1550
INCHES²	CENTIMETERS²	6.4516
INCHES²	MILLIMETERS²	645.2
MILLIMETERS²	INCHES²	0.0016

TO CONVERT FROM	***VOLUME CONVERSIONS TO***	***MULTIPLY BY***
CENTIMETERS³	INCHES³	0.061
INCHES³	CENTIMETERS³	16.387
MILLIMETERS³	INCHES³	6.102X 10 -5
INCHES³	MILLIMETERS³	1.639X 10 4
GALLONS(gal.)	LITERS(l.)	3.785
LITERS	GALLONS	0.2642

TEMPERATURE FORMULAS

°C= .56(°**F**-32)
°F =1.8(°**C**)+32

°C = DEGREES CELSIUS
°F = DEGREES FAHRENHEIT

Practice

Use the following quote specifications to solve the following problems:

Customer: SAFT
Part Name: ed120 Udel
Type: Polysolfone
Cost per pound: $4.40
Pounds per Thousand: 2019.82
Number of shots per hour: 27.69
Scrap: Do not figure

1. What is the quoted weight of each part in pounds?

2. How many grams will each part need to weigh to stay at the quoted rate? (Round to the nearest .5 gram)

3. How much will each part cost? (Round to the nearest penny.)

4. If the part is run at 925 grams, what will it cost Futura per part?

5. Per Hour?

6. Per Shift?

7. Per Day?

8. Per Week?

9. Per Year? (Assume 2 weeks of shut downs and no other holidays.)

Customer: General Electric
Part Name: Water Pan 162D2734 P003
Type: Perma
Cost per pound: $.47
Pounds per Thousand: 788.55
Number of shots per hour: 138.46
Scrap: Do not figure

10. What is the quoted weight of each part in pounds?

11. How many grams will each part need to weigh to stay at the quoted rate? (Round to the nearest .5 gram)

12. How much will each part cost? (Round to the nearest penny.)

13. If the part is run at 363 grams, how much extra will it cost Futura per part?

14. Per Hour?

15. Per Shift?

16. Per Day?

17. Per Week?

18. Per Year? (Assume 2 weeks of shut downs and no other holidays.)

Customer: Fisher Price
Part Name: 1761 Second Floor
Type: HIS 1
Cost per pound: $.4941
Pounds per Thousand: 519.82
Number of shots per hour: 129.38
Scrap: Do not figure

19. What is the quoted weight of each part in pounds?

20. How many grams will each part need to weigh to stay at the quoted rate? (Round to the nearest .5 gram.)

21. How much will each part cost? (Round to the nearest penny.)

22. If the part is run at 240 grams, how much extra will it cost Futura per part?

23. Per Hour?

24. Per Shift?

25. Per Day?

26. Per Week?

27. Per Year? (Assume 2 weeks of shut downs and no other holidays.)

28. As you look at the facts as presented here, of the three parts which is the most critical in terms of controlling part weight? If you were allowed to monitor only one of the three, which would you pick?

Answers

1. 2.01982 or 2.02 pounds
2. 917 grams
3. $8.89
4. $.0775328
5. $2.1468832
6. $17.175065
7. $51.525195
8. $360.67636
9. $18,033.818

---

10. .78855 pounds
11. 358 grams
12. $.37
13. $.0051762
14. $.7166966
15. $5.7335728
16. $17.200718
17. $120.40502
18. $6,020.251

---

19. .51982 pounds
20. 236 grams
21. $.26
22. $.0043532
23. $.563217
24. $4.505736
25. $13.517208
26. $94.620456
27. $4,731.0228

26. If you look at the bottom line, the part that will cost you the most if it is over the quoted weight limit is the SAFT product. If all other things were equal, that is where most managers would put their best efforts.

Of course, when you look at the bottom line, you can see that a small variation in part weight can make a

Big difference

in profits or losses for the company.

Fun Math

Let's find out why a penny is still worth worrying about. Remember in the introduction, we said that a wise economist once stated that if you look out for the pennies, the dollars will look out for themselves.

A simple illustration of this concept will help you understand why businesses often carry calculations past the second decimal place.

We can see this by recalculating problems 4-9 in the previous exercise. However for this exercise, round all numbers to the second decimal place. When you are finished, compare your new total to the first total. What was your difference? Was I the only one who decided to start picking up discarded pennies again?

Previous Answers	Rounded Answers
4. $.0775328	**4. $.08**
5. $2.1468832	**5. $2.22**
6. $17.175065	**6. $17.76**
7. $51.525195	**7. $53.28**
8. $360.67636	**8. $372.96**
9. $18,033.818	**9. $18,648.00**

The difference is not quite so much on a per part basis or even on an hourly basis, but look at the difference over the course of a year! And we only "dropped" a few parts of a penny each time. What if we had rounded up to the nearest dollar? Sounds like an interesting problem for your spare time.

Formulas to Remember

- **When you know the pounds per thousand (often written as #/M), use this formula:**

  $$\frac{\text{Weight in Pounds}}{1{,}000} \text{ X } 454 = \text{Part Weight in grams}$$

  (This is read: weight in pounds divided by one thousand times 454 equals the part weight in grams.)

- **When you know the weight of the part in grams, use this formula:**

  $$\frac{\text{Number of grams}}{454} = \text{Part weight in pounds}$$

  (This is read: number of grams divided by 454 equals the part weight in pounds.)

- **When you want to figure the cost of one part:**
  (Either of the two following options will work. You can't say you never have a choice.)

  Weight of the part in pounds X the cost of one pound of resin = cost of one part. Or:

  $$\frac{\text{Cost of the resin per pound}}{454} \text{ X the weight of the part in grams} = \text{cost of one part.}$$

Project Future
Competency Area 2.0: Mathematics

Competency Number 2.5:	Measurement
Lesson Number 2.5.5:	Read Production Gauges and Controls
Lesson Objective:	The trainee will accurately complete 10 of 15 problems that require reading gauges and machine controls.
Prerequisite Skills:	The trainee must understand the relationship between whole numbers and decimals. The trainee must be able to read.
Literacy Skills:	The trainee will demonstrate ability to interpret gauges. The trainee will complete information based on reading. The trainee will demonstrate critical thinking skills. The trainee will use mixed mathematics operations to solve problems.

Presentation:

I. The trainer will introduce the lesson by asking a trainee what time it is. The trainer will explain that the clock is one type of gauge. The trainer will use a bold-faced, numbered clock to explain that each small mark on the clock represents a minute that is between the two numbers. The trainer must draw a correlation between the clock and circular gauges. The trainer will use a digital display clock to explain similarities between it and some machine controls. Speedometers are also types of gauges.

II. The trainer will read through the handout, Tips for Reading Gauges and Controls, with the trainees.

III. The trainer will walk through the manufacturing plant with the trainees. The trainees will note the dials, gauges, and other controls on the machine.

Evaluation: The trainees will complete the exercise, Reading Gauges and Controls.

Extension Activity: The trainee will take an electric meter reading form his/her home.

Tips for Reading Gauges and Controls

Gauges are used to quickly check that a part is within the tolerance guide of the customer's orders. Gauging differs somewhat from precision measuring. Measuring requires the skillful use of precision measuring tools to determine the exact geometric size of the piece. Gauging on the other hand, simply shows whether the piece is made within the specified tolerances. Gauging is often used when great numbers of an item are manufactured and it is not practical to check every piece using a precision measuring instrument.

Several types of gauges have been developed. Each has a specific job to do.

Plug gauges are used to check whether hole diameters are within specified tolerances (specs--determined from the Quality Control Sheet). The double and cylindrical plug gauge has two ends known as GO and NO-GO plugs. The GO end should enter the hole with little or no interference. The NO-GO end should not enter if the opening is made to the specifications. The GO end is easy to tell from the NO-GO end because it is longer.

Ring gauges are used to check the diameter of an external diameter of a part. The GO and NO-GO ring gauge are separate units and can be distinguished from each other by a groove cut on the outer surface of the NO-GO gauge. On ring gauges, the opening of the GO gauge is larger than the NO-GO gauge.

Snap gauges function a lot like a ring gauge. There are three types:

1. The adjustable snap gauge can be adjusted through a range of sizes.
2. The non-adjustable snap gauge is made for one specific size.
3. The dial indicator snap gauge has the plus or minus tolerances read directly from the indicator. The dial face has a double row of graduation, reading in opposite directions form zero. Minus graduations are in red, and plus graduations are in black. They are available for gauging outside diameters from 0-2 inches, 2-4 inches, 4-6 inches, and 6-8 inches.

Thread gauges screw down into the part and are generally used to measure parts that have thread on them.

Gauge blocks are super-accurate steel measuring standards, commonly known as Jo-blocks. They are accepted by most ISO (International Standards Organizations) as standards of accuracy for all types of manufacturing. They are used to check and verify the accuracy of master gauges and in the tool room for machining where extreme accuracy is required. They are purchased in sets.

Dial Indicators are made like fine watches with shockproof movements and jeweled bearings. They are eight-balanced, where the figures read in both directions from "0" and the continuous type that reads from "0" in a clockwise direction. Dial faces vary widely in the range of graduations (the number of marks between the whole numbers). This measuring tool is used by reading the hand on the dial that is started by a sliding plunger. Place the plunger lightly against the work until the hand moves. The dial face is turned until the "0" coincides with the hand. As the work touching the plunger is slowly moved, the indicator hand will measure this movement. It is often used to show the difference between the high and low points of a part.

Other Gauging Tools

Air gauges use air pressure to measure hole sizes and are especially helpful when measuring deep internal bores.

Electronic gauges make extremely close measurements and are a comparison-type gauges. They must be calibrated by means of master gauge blocks.

Laser gauges produce a very narrow beam of extremely intense light that can be utilized for communication, medical, and industrial applications. They are quick and accurate.

Optical comparators use magnification to inspect a part. An enlarged image of the part is projected upon a screen for inspection. The part picture is superimposed upon an enlarged, accurate drawing of the correct shape size. Visual comparison is made.

Optical flats use light waves as a measuring standards. Light bands reflect the shape of the part and magnify the problems.

Thickness Gauges are pieces of metal manufactured to precise thicknesses. They are marked at regular intervals. They are ideal for measuring small slots, setting small gaps and clearances, determining fit when two surfaces meet, and for checking flatness of parts in straightening operations.

Screw pitch gauges are used to determine the pitch or number of threads per inch and are available in English and metric thread sizes.

Fillet and radius gauges are thin steel blades and are used to check concave and convex radii on corners or on shoulders or as a template when ringing form cutting tools.

Drill rods are steel rods used to inspect hole alignment and location, checking hole diameters in the same manner as a plug gauge.

When reading the gauges use these general tips.

Be certain of what type of gauge you are supposed to use. If you are not certain, it is better to ask now than to incorrectly gauge an entire shift's parts incorrectly.

Double check the Quality Control Requirement Sheet and the specifications for the part.

Check the mock-up or standard sample.

Calibrate the instrument with a known weight, scale, or block gauge.

Check the whole numbers. Are they in increments of 5, 10, or 100?

Check the lines between the whole numbers. How many are there-- 3, 5, or 10? Start counting after one whole number and end with the next whole number. The number of divisions will need to be added to the whole number to get the accurate reading.

Make the reading and fill out the paper work.

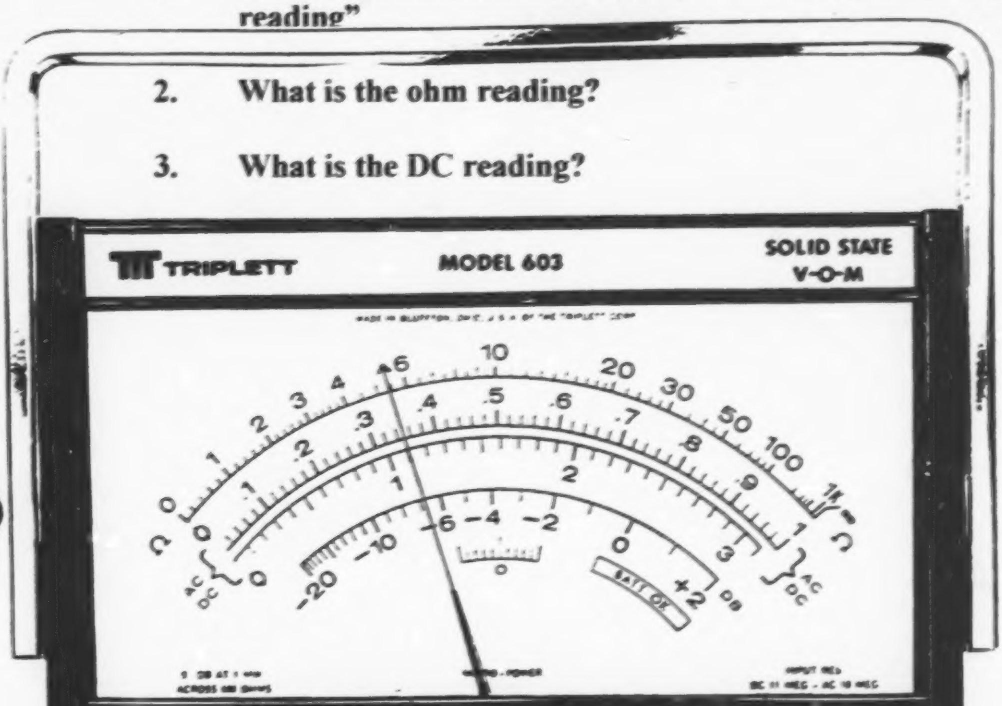
Reading Gauges and Controls

Read the following gauges or controls and answer the questions that follow.

1. **On a volt-ohmmeter below, what is the AC (alternating current) reading"**

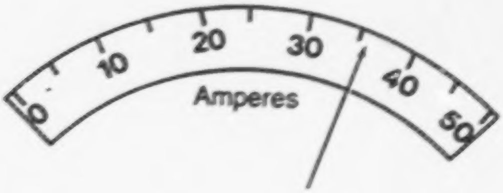
2. **What is the ohm reading?**

3. **What is the DC reading?**

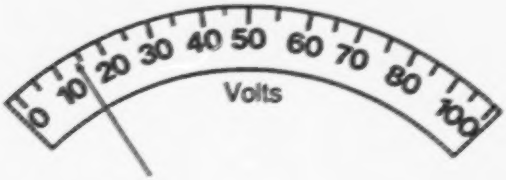

TRIPLETT
MODEL 603
SOLID STATE
V-O-M
10
20
30
50
100
1K
Ω
AC
DC
-20
-10
-6
-4
-2
0
3
+2
DB
BATT OK
ZERO
1000
300
100
30
10
3
1
.3
60db
50
40
30
20
10
0db
-10db
A
C
·
D
C
V
O
L
T
S
TRANSIT
x1 MEG
x10 K
x1K
x100
x10
x1
1000
100
10
1
AP
DEPRESS
- AND -
LP Ω
BATT CHECK
AC - DC MA

Typical solid state volt-ohmmeter.

4. **What is the reading in amperes on the meter below? Amperes are a measure of an amount of electrical current.**


0
10
20
30
40
50
Amperes

5. **What is the volt reading on the voltmeter below? Volts are a measure of electric force.**

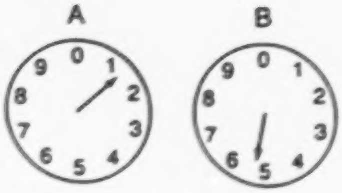

0
10
20
30
40
50
60
70
80
100
Volts

6-8. **Pictured below are some molding machine controls. What is the reading on:**

A:

B:

C:


A
B
0
1
2
3
4
5
6
7
8
9

B

FUTURA PLASTICS
INSPECTION INSTRUCTION SHEET

SHEET 1 OF 4

CUSTOMER: GENERAL ELECTRIC PART NO.: 162D3835P005 REVISION: 9 DATE: 1/13/92

OPERATION #.: 10 PART NAME: COVER HINGE (ALMOND) PREPARED BY: BILL DOHERTY DATE: 1/23/95

MOLD #.: 2246 PART CODE: GEN03 APPROVED BY: CINDY CLAYTON DATE: 2/10/95

OF CAVITIES: 4 STD PART WEIGHT 31.33 g CUSTOMER APPROVAL: ____ DATE: ____

PROCEDURE:

1. FOLLOW THE REFERENCED SPECIFICATIONS.
2. USE THE GAUGES LISTED BELOW.
3. INSPECT EACH OF THE CHARACTERISTICS LISTED BELOW IN ACCORDANCE WITH THE PRESCRIBED METHOD.
4. INSPECTION WILL BE PERFORMED IN ACCORDANCE WITH THE SAMPLE SIZE AND FREQUENCY CALLED FOR.
   - A. WHEN NONCONFORMING PARTS OCCUR, INFORM SUPERVISOR AND INSPECTOR.
   - B. PARTS ARE TO BE FREE OF OBJECTIONAL APPEARANCE DEFECTS. SEE EXHIBITS FROM STANDARDS ROOM.

ITEM NO.	CHARACTERISTIC	METHOD OF MEASUREMENT	FREQ CHECK	CHECK BY	TYPE	CATE-GORY
1	APPEARANCE AREA TO BE FREE OF COLOR SPECS AND FLOW LINES THAT ARE READILY OBSERVABLE WHEN VIEWED	VISUAL	100%	O		
	AT ARMS LENGTH FOR 2 SECONDS.					
2	GLOSS 60 TO 90. TO REDUCE SINK APPEARANCE KEEP GLOSS TO LOW SIDE. NOTE: 3 EJECTOR PINS & LETTER A	GLOSS METER	HOURLY	I		
	MAY APPEAR SOMEWHAT ON APPEARANCE AREA.	VISUAL	100%	O		
3	WARBLE IS NOT PASSABLE.	VISUAL	100%	O		
4	BREAK GATE OFF WARM. PUSH INWARDS TO PREVENT ROUGH EDGE.	VISUAL	100%	O		
5	USE APPEARANCE SAMPLES ON PEGBOARD FOR ALL VISUAL QUESTIONS.	VISUAL	100%	O		
6	FLASH IS NOT PASSABLE.					
7	ELONGATED HOLE .171 +/- .005 X .269 +/- .005 (NO FLASH IN HOLE).	GAGEPIN & CALIPER	EVERY 4 HOURS	I		
8	ITEMS 1 - 7.		EVERY HOUR	I		
9	ITEMS 1 - 7.		TWICE A SHIFT	F		

*F = FOREMAN *O = OPERATOR *I = INSPECTOR

Q106

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FUTURA PLASTICS
INSPECTION INSTRUCTION SHEET

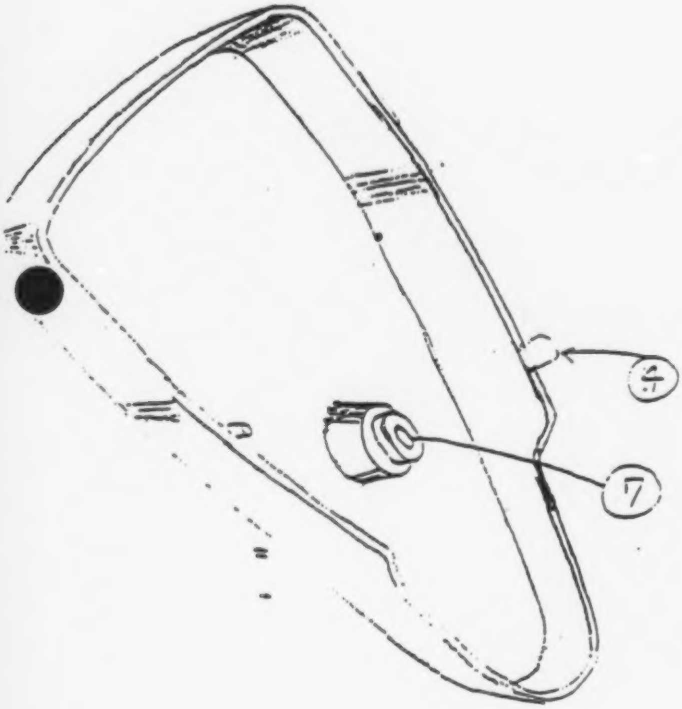
SHEET 3 OF 4

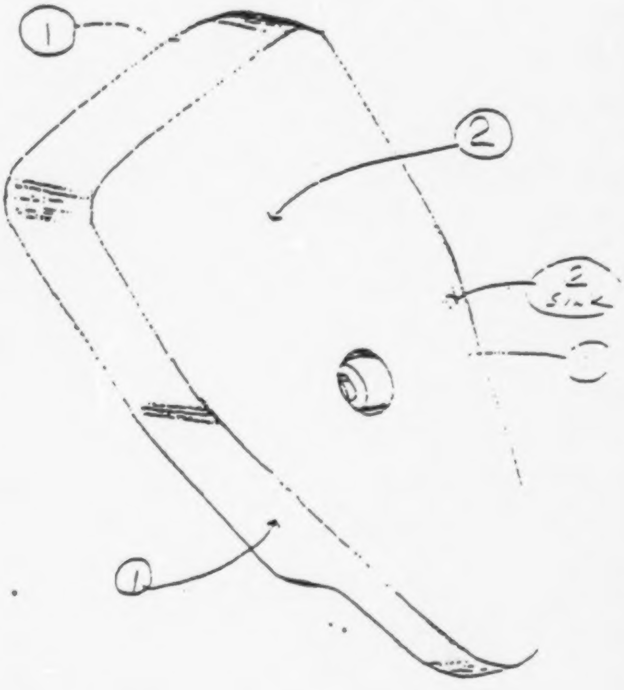
CUSTOMER: GENERAL ELECTRIC PART NO.: 162D3835P005 REVISION: 9 DATE: 1/13/92

OPERATION #.: 10 PART NAME: COVER HINGE (ALMOND) PREPARED BY: BILL DOHERTY DATE: 1/23/95

MOLD #.: 2246 PART CODE: GEN03 APPROVED BY: CINDY CLAYTON DATE: 2/10/95

OF CAVITIES: 4 STD PART WEIGHT 31.33 g CUSTOMER APPROVAL: ______ DATE: ______





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FUTURA PLASTICS
INSPECTION INSTRUCTION SHEET

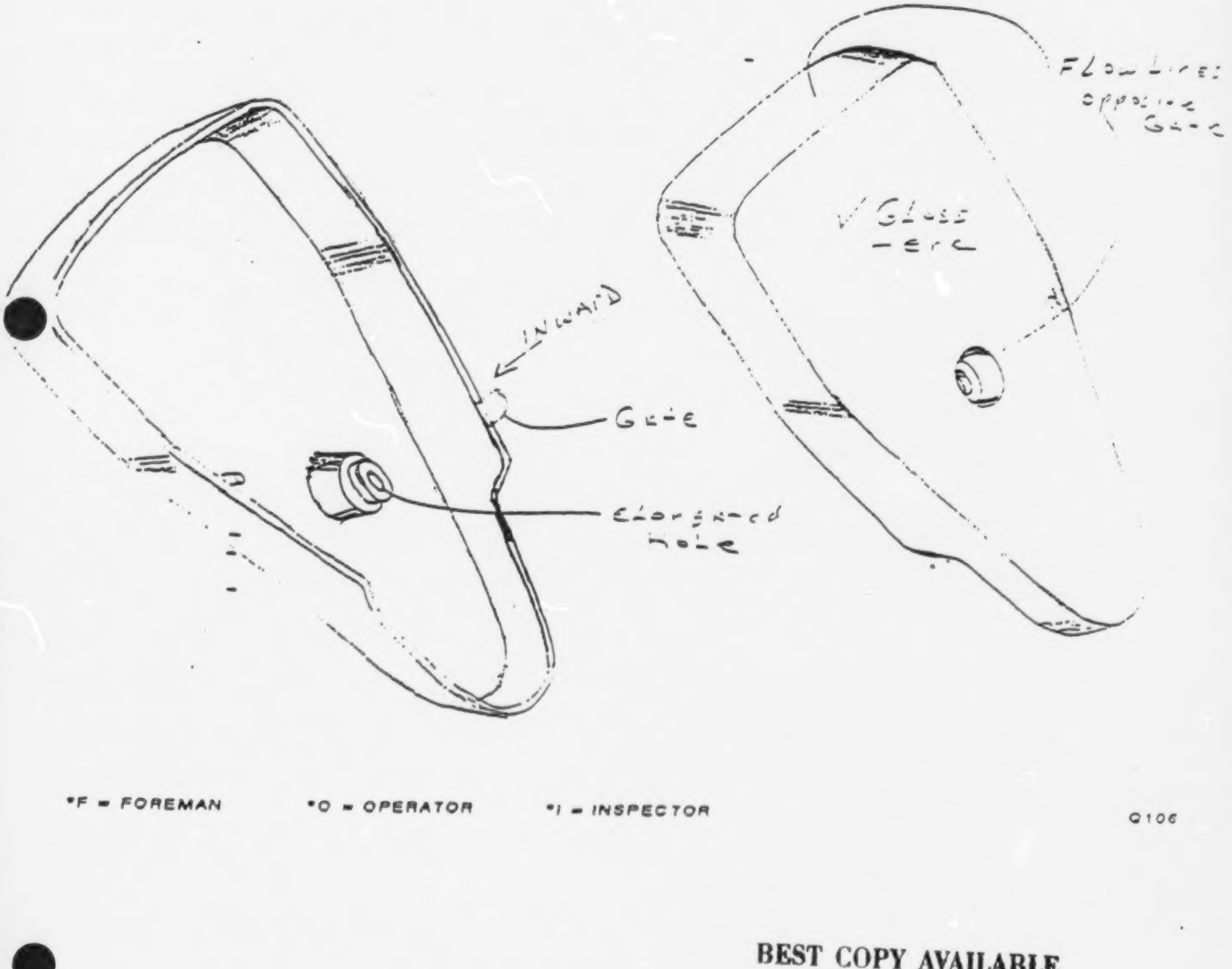
SHEET 3 OF 4

OMER: GENERAL ELECTRIC
PART NO.: 162D3835P005
REVISION: 9
DATE: 1/13/92

OPERATION #.: 10
PART NAME: COVER HINGE (ALMOND)
PREPARED BY: BILL DOHERTY
DATE: 1/23/95

MOLD #.: 2246
PART CODE: GEN03
APPROVED BY: CINDY CLAYTON
DATE: 2/10/95

OF CAVITIES: 4
STD PART WEIGHT 31.33 g
CUSTOMER APPROVAL:
DATE:


INWARD
Gate
Elongated Hole
Flow Lines: opposite Gate
Gloss here

*F = FOREMAN *O = OPERATOR *I = INSPECTOR

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FUTURA PLASTICS
INSPECTION INSTRUCTION SHEET

SHEET 4 OF 4

CUSTOMER: GENERAL ELECTRIC PART NO.: 162D3835P005 REVISION: 9 DATE: 1/13/92

OPERATION #.: 10 PART NAME: COVER HINGE (ALMOND) PREPARED BY: BILL DOHERTY DATE: 1/23/95

MOLD #.: 2246 PART CODE: GEN03 APPROVED BY: CINDY CLAYTON DATE: 2/10/95

# OF CAVITIES: 4 STD PART WEIGHT: 31.33 g CUSTOMER APPROVAL: ________ DATE: ________

PACKAGING:

1) *BOX 15 X 15 X 15 FUTURA*

13) CHIPBOARD DIVIDER 15 X 15 X 15

2) LABEL OPPOSITE CORNERS

PLACE 2 ROWS OF 5 PARTS SIDE BY SIDE THEN PLACE 4 IN THE MIDDLE FOR A TOTAL OF 14 PARTS PER LAYER. USE A CHIPBOARD DIVIDER FOR 14 LAYERS. FOR A TOTAL OF 196 PARTS PER BOX.

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Project Future
Competency Area 2.0: Mathematics

Competency Number 2.6: Statistics

Lesson Number 2.6.1: Read and Interpret Production Graphs.

Lesson Objective: Given an exercise, Graphs In The Plastics Industry, of four line, circle, and bar graphs, the trainees will correctly complete 15 of the 20 items about the graphs.

Prerequisite Skills: Trainee must be able to read sentences.
Trainee must be able to compare whole number and decimal values.

Literacy Skills:

The trainee will read and apply information contained in graphs.
The trainee will be able to make comparisons.
The trainee will be able to identify the various types of graphs.

Presentation:

I. The trainer will introduce the lesson by bringing in various photographs of people performing an activity. The trainer will show the "snapshots" to the trainees. The trainer will explain that a graph is a snapshot of information about a certain subject. Graphs make it easier to get a quick impression of a great deal of data and to make comparisons and draw conclusions. Graphs are found everywhere. The trainer will ask the trainees to name some places they have seen graphs-- in the newspaper, in magazines, in training manuals, and on the employee bulletin board.

II. The trainer will break the trainees into groups of three. The groups will each decide upon a subject for a survey (perhaps how many employees are bald, or are male or female, etc.) about fellow employees. The trainees will take the survey by walking out into the plant and asking one question of at least 10 employees. The trainees will use the information gathered to decide upon a type of graph to use in picturing their data for the class. During their presentations they should explain:

1. what topic they decided upon
2. why they chose that topic
3. how they gathered their data
4. what their **population** (explain this statistical concept) was for the sample (explain this statistical concept also).

The trainees will show their graphs and explain their findings.

Evaluation: The trainees will complete the exercise, Graphs in The Plastics Industry. Trainees will self score, using an answer key.

Extension Activity: The trainees will create a graph that reflects a home budget and a graph that reflects the amount of deductions from their checks.

Graphs in the Plastics Industry

There are four basic types of graphs: the pictograph, the circle graph, the bar graph, and the line graph. Using pictures on either the overhead or chart display, the instructor will show each graph as he/she defines them.

The pictograph uses pictures or symbols to display information. The pictograph usually has a key to show the value of each symbol. They are read by counting the symbols on a line of a graph and computing their value.

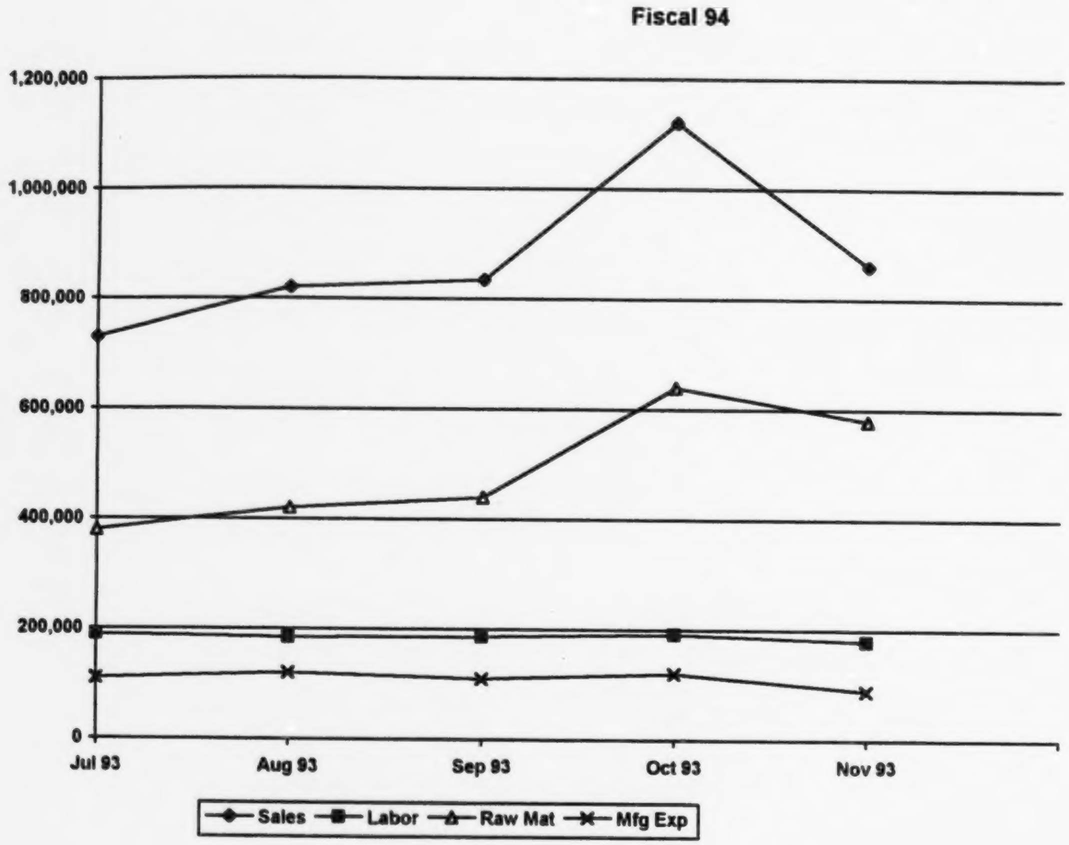
The circle graph uses parts of a circle to show information. Circle graphs show values in each part of a divided circle. A part of a circle graph is called a **segment** or a **section**.

The bar graph uses thick bars to show information. Bar graphs can be drawn with the bars running up and down. The bars are placed at equal distances along the horizontal axis that runs across the bottom of the graph. Bar graphs can also be drawn with the bars running from left to right. The bars are placed at equal distances along the vertical axis on the left side of the graph. Bar graphs may also use a key to show additional information.

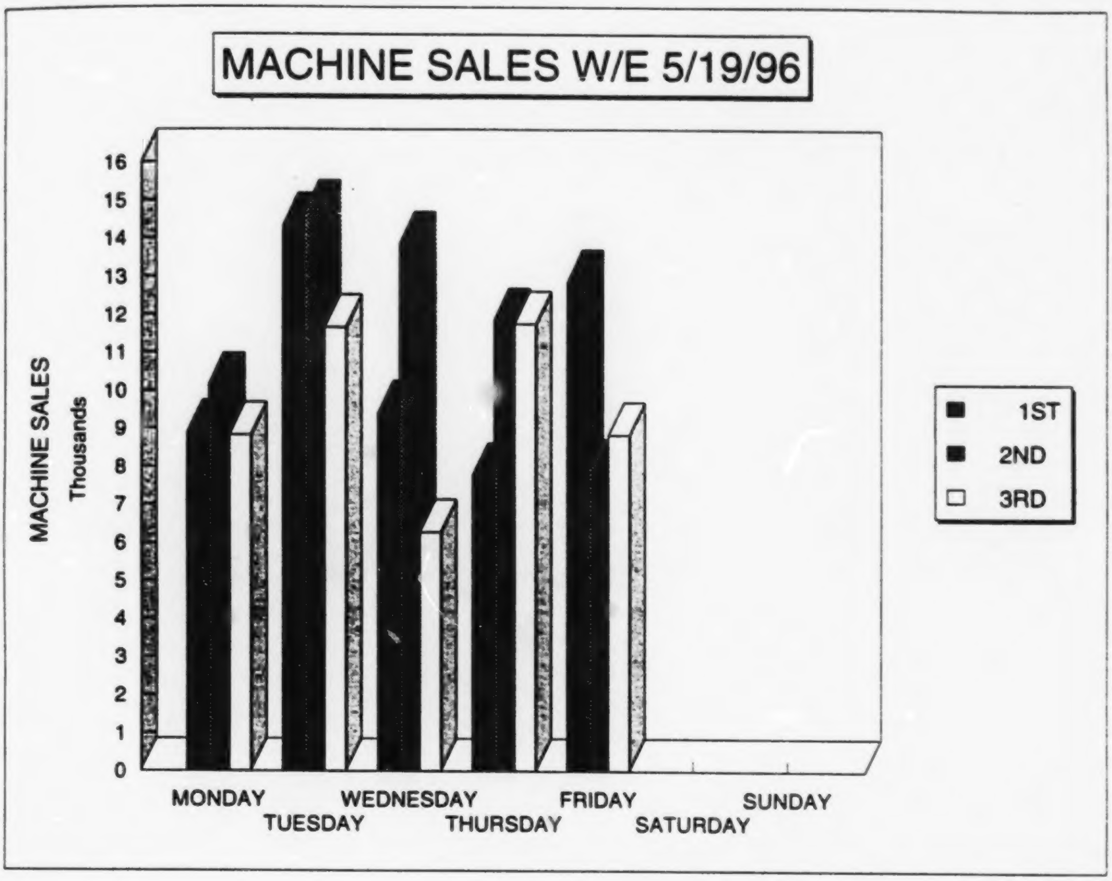
A line graph is drawn with one or more thin lines that extend across the graph. A line graph also uses values along a horizontal and a vertical axis. A line graph is most useful in showing trends and developments over a period of time. Schedules and charts show specific values by listing numbers and words in columns and rows. Charts are most often used to compare values of one item with another. Schedules and charts have titles. They often contain tables. A table is a list of words and numbers written in rows and columns. Columns are read up and down. Rows are read across.

Practice

1-5. Use the graph to answer the following questions:



1. What type of graph is pictured?
2. What does this graph show?
3. During what month did the company have sales of $1,100,000?
4. What were the Dollar Sales for September?
5. What was the cost of raw material in August?



6. What were the Machine Sales of the first shift on Tuesday?

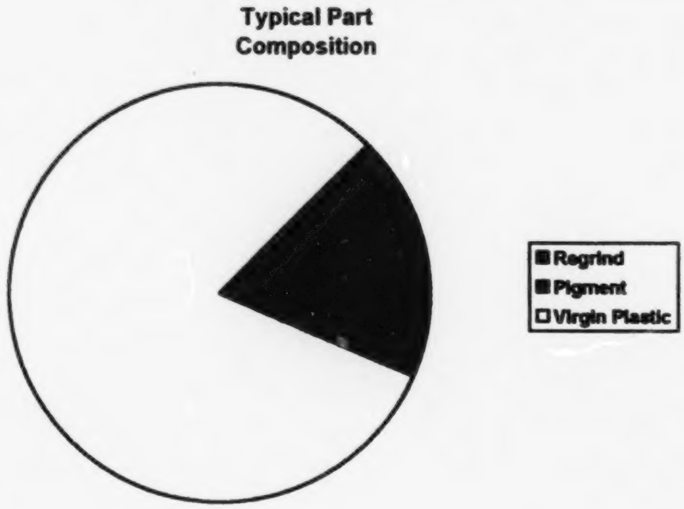
7. What were the Machine Sales of the second shift on Tuesday?

8. What were the Machine Sales of the third shift on Tuesday?

9. Which shift had the highest Machine Sales on any day?

10. Which shift had the lowest Machine Sales on any day?

Percentage of Regrind, Virgin Material, and Pigment



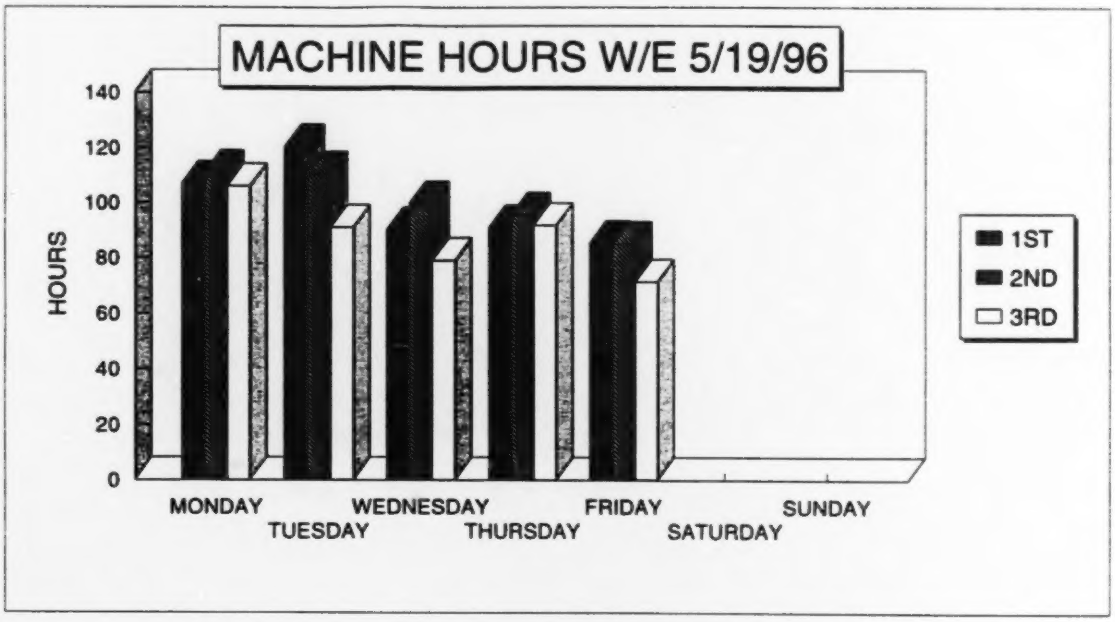
11. What type of graph is pictured here?

12. What does the graph show?

13. What is the percentage of colorant in this part?

14. What is the percentage of material that is not colorant in this part?

15. What is the percentage of virgin material in this part?



16. What type of graph is used?

17. What does the graph show?

18. How many machine hours did the second shift contribute on Monday?

19. How many machine hours did the first shift contribute on Monday?

20. Which shift contributed the most machine hours on Tuesday?

Project Future
Competency Area 2.0: Mathematics

Competency Number 2.6: Statistics

Lesson Number 2.6.2: Determine Mean and Range.

Lesson Objective: Given the exercise, Determining Mean and Range in Plastics Production, the trainees will correctly complete 15 of the 20 problems.

Prerequisite Skills: The trainee must be able to read sentences.
The trainee must be able to understand whole number and decimal values.

Literacy Skills: Trainee will read and apply information.
Trainee will be able to make comparisons.
Trainee will use multiple mathematics operations to compute mean and range.

Presentation:

I. The trainer will introduce the lesson by asking trainees what their average take-home pay is for each week. How do they know? Compare this to mean. They "mean" the same thing. Average or mean is the resulting value from adding a group of numbers together and dividing the sum by the number of items in the group. The trainer will work samples on the board.

II. The trainer will explain that range is the difference between the greatest and smallest value in the group. The trainer will show samples on the board.

Evaluation: The trainees will complete the exercise, Determining Mean and Range in Plastics Production.

Extension Activity: Using daily newspapers from the past week, the trainees will compute the mean and range of sports scores.

Determining Mean and Range in Plastics Production

To determine the mean or average, add up the numbers and divide the sum by the number of numbers in your set of data. This set of data is sometimes called a population. A population of data has a set of identifiable characteristics in common.

The range is the difference between the largest and the smallest value in the group.

Practice:

The part weights for the random samples of FISA3 for shift 1 were:

112.12 110.9 111.8 112.3 111.9

1. What is the average part weight?

2. What is the range of part weight?

The part weights for the random samples of FAM890 for shift 3 were:

276.90 275.22 275.44 276.90 275.35

3. What is the average part weight?

4. What is the range of part weight?

The part weights for the random samples of GFE 764 for shift 2 were:

62.00 66.2 63.1 62.90 60.9 61.3

5. What is the average part weight?

6. What is the range of part weight?

The part weights for the random samples of GFE 764 for shift 2 were:

2632.16 2543.11 2632.16 2633.1 2632.99 2631.7

7. What is the average part weight?

8. What is the range of part weight?

The part weights for the random samples of JFH287 for shift 1 were:

345.91 324.8 345.64 344.99 345.77 340.8

9. What is the average part weight?

10. What is the range of part weight?

The part weights for the random samples of ESJ678 for shift 2 were:

534.14 543.11 632.16 633.1 632.99 631.7

11. What is the average part weight?

12. What is the range of part weight?

The part weights for the random samples of KLJ781 for shift 2 were:

34.14 43.11 32.16 33.1 32.99 31.7

13. What is the average part weight?

14. What is the range of part weight?

The part weights for the random samples of GTI897 for shift 3 were:

263.16 253.11 262.16 263.1 263.99 261.7

15. What is the average part weight?

16. What is the range of part weight?

The part weights for the random samples of GFE 764 for shift 2 were:

632.16 543.11 632.16 633.1 632.99 631.7

17. What is the average part weight?

18. What is the range of part weight?

The part weights for the random samples of GFE 764 for shift 2 were:

263.16 254.11 263.16 263.5 263.99 263.91

19. What is the average part weight?

20. is the range of part weight?

Project Future
Competency Area 2.0: Mathematics

Competency Number 2.6: Statistics

Lesson Number 2.6.3: Determine Median and Mode.

Lesson Objective: Given the exercise, Determining Median and Mode in Plastics Production, the trainees will correctly complete 15 of the 20 problems.

Prerequisite Skills: The trainee must be able to read sentences.
The trainee must be able to understand whole number and decimal values.

Literacy Skills: Trainee will read and apply information.
Trainee will be able to make comparisons.
Trainee will use multiple mathematics operations to compute median and mode.

Presentation:

I. Using a picture of a divided highway, the trainer will ask the trainees to define what the strip of grass between the two sides of the highway is called--median; will lead trainees to discuss the similarities between the two sides of the highway--there are two lanes on each side of the median. This is a definition of the term *median*. The median is the number at which half the values in a sample fall above it and half fall below it. It may or may not be the same as the mean. To obtain the median, list all the numbers in a population and add the measurement just above the middle value and divide by two. This will give you the exact midpoint or median.

II. The trainer will explain that mode is the most frequently used number in a sample population. For example, in the list, 11, 23, 45, 23 , the 23 is the mode. It is the most frequently occurring number or value.

III. The trainees will go out into the plant with a clipboard and will determine the number of people with blond, red, brown, and black hair who are working on a shift. The trainees will list the numbers and compute the median and the mode.

Evaluation: The trainees complete the exercise, Determining Median and Mode in Plastics Production. The trainees will self score the exercise.

Extension Activity: Using daily newspapers from the past week, the trainees will compute the mean, median, mode, and range of the temperatures.

Determining Median and Mode in Plastics Production

The median of a set of data is the middle value when the pieces of data are put in order from smallest to largest. Put the data in order and circle the number that is in the middle.

The mode in a set of data is the number that occurs most frequently in the set.

Practice:

The part weights for the random samples of FISA3 for shift 1 were:

112.12 110.9 111.8 112.3 111.9 112.12

1. What is the median part weight?
2. What is the mode of part weight?

The part weights for the random samples of FAM890 for shift 3 were:

276.90 275.22 275.44 276.90 275.35 275.22

3. What is the median part weight?
4. What is the mode of part weight?

The part weights for the random samples of GFE 764 for shift 2 were:

62.00 66.2 63.1 63.1 62.90 63.1 60.9 61.3

5. What is the median part weight?
6. What is the mode of part weight?

The part weights for the random samples of GFE 764 for shift 2 were:

2632.16 2543.11 2632.16 2633.1 2543.11 2543.11

7. What is the median part weight?
8. What is the mode of part weight?

The part weights for the random samples of JFH287 for shift 1 were:

345.91 324.8 345.64 324.8 345.77 324.8

9. What is the median part weight?

10. What is the mode of part weight?

The part weights for the random samples of ESJ678 for shift 2 were:

534.14 543.11 632.16 632.16 632.99 632.16

11. What is the median part weight?

12. What is the mode of part weight?

The part weights for the random samples of KLJ781 for shift 2 were:

34.14 43.11 32.16 33.1 32.99 31.7 32.16

13. What is the median part weight?

14. What is the mode of part weight?

The part weights for the random samples of GTI897 for shift 3 were:

263.16 253.11 262.16 263.1 263.99 261.7

15. What is the median part weight?

16. What is the mode of part weight?

The part weights for the random samples of GFE 764 for shift 2 were:

632.16 633.1 632.16 633.1 632.99 631.1

17. What is the median part weight?

18. What is the mode of part weight?

The part weights for the random samples of GFE 764 for shift 2 were:

263.16 254.11 263.16 254.11 263.99 254.11

19. What is the median part weight?

20. What is the mode of part weight?

Project Future
Competency Area 2.0: Mathematics

Competency Number 2.6: Statistics

Lesson Number 2.6.4: Determine Probability.

Lesson Objective: Given the exercise, Production Problems, What Are the Odds?, the trainees will correctly solve 10 of the 15 problems.

Prerequisite Skills: The trainee must be able to read sentences.
The trainee must be able to compute whole numbers and read fractions.

Literacy Skills: The trainee will use a formula to compute probability.
The trainee will read and apply information.

Presentation:

I. The trainer will introduce the lesson by the rolling a die and asking the trainees what are the chances of the die rolling a one (snake eye) on the next roll. What are the chances of rolling an odd number? An even number? There are six sides to a die. On a fair die, each side is equally likely to be turned up after the die is tossed. The probability that the side with one dot lands up is one in six or 1/6. The trainer will write the formula that goes with figuring probability on the board.

$$P = \frac{\text{number of favorable ways}}{\text{total number of ways}}$$

The secret to using a formula is to replace the words with the numbers that mean the same thing. The line between the numbers means *divided by*.

II. The trainees will complete the exercise, Practicing Finding Probability.

Evaluation: The trainees will complete the exercise, Production Problems, What Are the Odds?

Extension Activity: Using a tip sheet from Churchill Downs, the trainees will compute the probability of a horse whose number they draw from a hat.

What Are the Odds?

In order to accurately predict production needs, production personnel must be able to figure the probability that an event will happen a certain number of times based on available evidence.

To calculate probability, you can set up the problem as a fraction and reduce to lowest terms.

$$\frac{\text{number of favorable ways}}{\text{number of unfavorable ways}}$$

Calculate the probability in the following production problems involving one part molds.

1. Machine number 2 makes 513 shots per shift. What are the odds that three of the parts will be rejects?
2. Machine number 21produces 604 shots per shift. What are the odds that eight of the parts will be rejects?
3. Machine number 20 produces 633 shots per shift. What are the odds that three of the parts will be rejects?
4. Machine number 7 produces 472 shots per shift. What are the odds that twenty of the parts will be rejects?
5. Machine number 4 produces 545shots per shift. What are the odds that forty-five of the parts will be rejects?
6. Machine number 18 produces 795 shots per shift. What are the odds that one hundred sixty-five of the parts will be rejects?
7. Machine number 19 produces 604 shots per shift. What are the odds that eighteen of the parts will be rejects?
8. Machine number 15 produces 346 shots per shift. What are the odds that fourteen of the parts will be rejects?
9. Machine number 5 produces 468 shots per shift. What are the odds that two of the parts will be rejects?
10. Machine number 10 produces 388 shots per shift. What are the odds that thirty-four of the parts will be rejects?

11. Machine number 1 produces 300 shots per shift. What are the odds that thirty of the parts will be rejects?

12. Machine number 11 produces 33 shots per hour. What are the odds that three of the parts will be rejects?

13. Machine number 2 produces 120 shots per hour. What are the odds that thirty-four of the parts will be rejects?

14. Every sixth shot is bad. What are the odds of a good shot being next?

Project Future
Competency Area 2.0: Mathematics

Competency Number 2.6: Statistics

Lesson Number 2.6.5: Prepare Average and Range (XR) Charts and Histographs Used in Process Control.

Lesson Objective: Given three sets of data, the trainee will correctly complete three Average and Range Charts.

Prerequisite Skills:
The trainee must be able to read instructions.
The trainee must be able to compute whole number and decimal values.
The trainee must be able to compute averages and ranges.

Literacy Skills:
The trainee will read and apply information.
The trainee will compute whole number and decimal values, including averages and ranges.
The trainee will categorize information.
The trainee will demonstrate ability to read and prepare graphs.

Presentation:

I. Prior to class, the trainer will obtain three XR charts for each student from the Quality Control Department.

II. The trainer will ask how the employees know when their car needs to be repaired and has been successfully repaired. The trainee should answer that they identify the problem and then take it to the repair shop. Then they drive the car and gauge the results of the repair. This is the way process control works. It uses statistics to gauge certain characteristics of a product. By analyzing this data, production personnel can determine exactly when a problem occurs. This information will help them determine the cause and make repairs without guessing how and when.

III. The trainer will explain that a Histograph is a special kind of bar graph that shows the information on one population for a specified period of time.

Evaluation: The trainees will prepare three Average and Range (XR) charts using data given. The trainees will prepare a histograph for the three charts.

Extension Activity: The trainees will weigh themselves everyday for one week. They will complete an Average/Range Chart and a Histograph of their weight measurements.

Average and Range Chart Data

Using the date below, complete the three average and range charts attached. When you have completed the charts, prepare a histograph that pictures the history of each part.

Chart 1

Weight of Sample on shift 1

6:00 Sampling	8:30 Sampling	12:00 Sampling
Sample 1: 1108.9	1109.7	1108.7
Sample 2: 1109.8	1109.1	1108.7
Sample 3: 1109.1	1109.6	1107.6
Sample 4: 1108.9	1108.9	1106.8

Size of exterior dimension on shift 1

6:00 Sampling	8:30 Sampling	12:00 Sampling
Sample 1: 110.8	110.9	110.8
Sample 2: 110.9	110.9	110.8
Sample 3: 110.9	110.9	110.7
Sample 4: 110.8	110.8	110.6

Chart 2

Weight of Sample on shift 1

6:00 Sampling	8:30 Sampling	12:00 Sampling
Sample 1: 234.9	235.7	235.8
Sample 2: 233.8	234.9	232.7
Sample 3: 245.9	236.8	234.2
Sample 4: 234.7	245.8	234.2

Size of exterior dimension on shift 1

6:00 Sampling	8:30 Sampling	12:00 Sampling
Sample 1: 2.9	2.3	2.1
Sample 2: 2.5	2.1	2.0
Sample 3: 2.3	2.0	1.9
Sample 4: 1.8	1.9	2.3

AVERAGE AND RANGE CHART - CONTAINER MOLDING

FUTURA PLASTICS

PLANT	MACHINE	SET-UP INITIALS	MOLD #	PART #	PART DESCRIPTION
	PART WEIGHT SHUT DOWN				

PART WEIGHT

SHIFT/DAY																	
SUM																	
AVERAGE, X																	
RANGE, R																	

A: NOTES																		
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18

FILL TIME

1																	
SUM																	
B:NOTES																	

1

JOHNSON CONTROLS

AVERAGE AND RANGE CHART - CONTAINER MOLDING

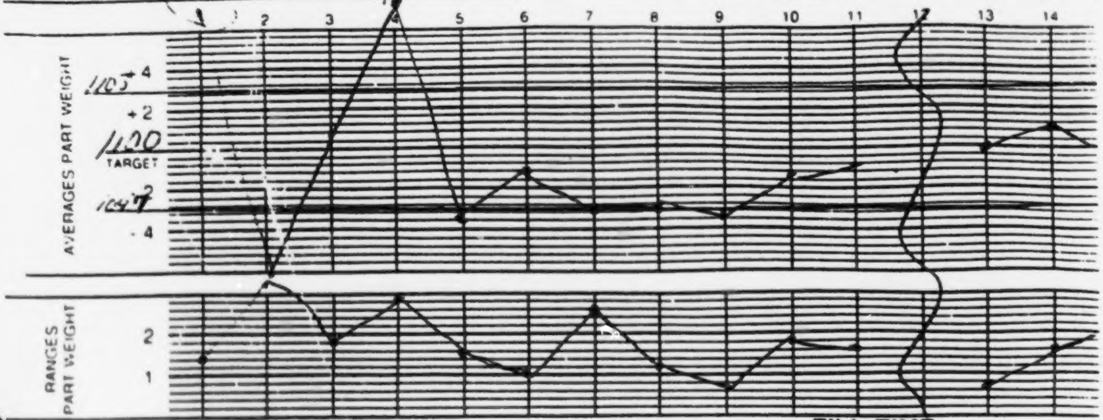
PLANT	MACHINE	SET-UP INITIALS	MOLD #	PART #	PART
Futura	23	T.P.	1297	110-14778	5

PART WEIGHT START-UP	PART WEIGHT SHUT-DOWN	FILL TIME START UP	FILL TIME SHUT-DOWN	ENDWALL THICKNES
				L:

PART WEIGHT

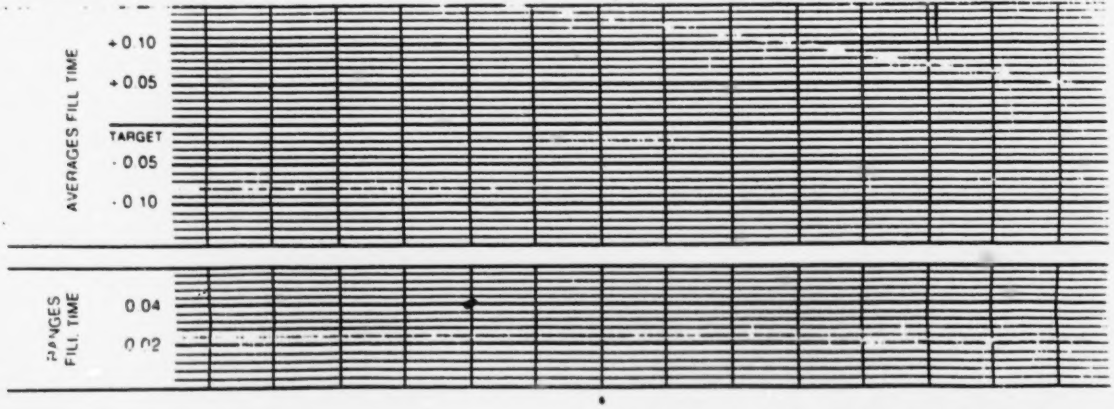
1 '7 2.0 9/19③ 9/20 1st 9-20 2.1 9-20 3rd 9-21 2.1

SHIFT/DAY		5:00	9:00	1	5	9	1.00	5:00	9.00	1	5	9		5:00	1.
	1	1103.1	1120.4	1100.5	1110.7	1096.5	1098.2	1097.1	1097.4	1096.7	1098.7	1099.9	D	1099.7	1100.6
	2	1101.6	1018.2	1102.0	1111.0	1097.0	1098.8	1096.6	1096.7	1097.2	1098.8	1098.8		1100.3	1101.4
	3	1108.2	[illegible]	1100.2	1113.4	1097.5	1098.6	1095.7	1097.1	1096.8	1098.5	1098.6	O	1100.1	1101.8
	4	1103.1	[illegible]	1100.7	1113.6	1095.9	1099.2	1098.3	1097.9	1096.5	1097.0	1098.4		1100.4	1100.2
SUM		[illegible]	[illegible]	4403.5	4448.7	4386.9	4394.8	4387.7	4389.1	4387.2	4393	4395.7	W	4400.5	4404.0
AVERAGE. X		[illegible]	[illegible]	1100.8	1112.1	1096.7	1098.7	1096.9	1097.2	1096.8	1098.3	1098.9		1100.1	1101.0
RANGE. R		1.1	10.1	1.7	2.9	1.6	1.0	2.6	1.2	.7	1.8	1.5	N	.7	1.6
A NOTES		Y	Y		Y					Y					



FILL TIME

	1	[illegible]	3.28	3.29	3.24	3.23		3.24	3.27	3.25	3.21	3.25		3.2	3.21
	2	[illegible]	3.28	3.30	3.26	3.19		3.25	3.27	3.25	3.23	3.23		3.20	3.17
	3	[illegible]	[illegible]	3.26	3.24	3.23		3.32	3.26	3.25	3.23	3.22		3.21	3.23
	4	[illegible]	3.27	3.28	3.26	3.22		3.27	3.25	3.27	3.22	3.23		3.18	3.28
SUM		13.2	13.08	13.13	13.	12.87		13.08	13.05	13.02	12.89	12.93		12.81	12.89
AVERAGE. X		[illegible]	3.27	3.28	3.25	3.21		3.27	3.26	3.26	3.22	3.23		3.20	3.22
RANGE. R		.0	.03	.04	.02	.04		.08	.02	.02	.02	.3		.04	.11
B NOTES															



PRINCIPAL PROBLEM CHARACTERISTIC

NUMBER INSPECTED	4	4	4	4	4		4	4	4	4	4		4	4
NARPAGE	NA	NA	NA	NA	NA		NA	NA	NA	NA	NA		NA	NA
WARPAGE	NA	NA	NA	NA			NA	NA	NA	NA			NA	NA
DIELECTRIC TEST	OK	OK	OK	OK	OK		OK	OK	OK	OK	OK		OK	OK
BURNS	NO	NO	N	N	NO		NO	NO	NO	NO	NO		NO	NO
FLASH	NO	NO	N	N	NO		NO	NO	NO	NO	NO		NO	NO
OIL/GREASE	NO	NO	N	N	NO		NO	NO	NO	NO	NO		NO	NO

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Project Future
Competency Area 2.0: Mathematics

Competency Number 2.7: Geometric Concepts

Lesson Number 2.7.1: Understand Geometric Shapes and Angles When Reading Blueprints

Lesson Objective: Given 20 problems involving geometric concepts in the plastics industry, the trainee will correctly solve 15 of the problems.

Prerequisite Skills: The trainee must be able to read sentences.
The trainee must be able to compute whole number and decimal values.

Literacy Skills: The trainee will read and apply information.
The trainee will be able to make comparisons.
The trainee will use formulas to solve geometric problems.
The trainee will read blueprints.

Presentation:

I. The trainer will ask the trainees to figure the number of baseboards needed (perimeter) and the amount of carpeting needed (area) to recover the floor of the training room. After the trainees have worked on the project a few minutes, the trainer will show the formula's page. The trainer will read over the page explaining each formula's purpose as it is read. Allow the trainees to complete the assignment.

II. Using an overhead projector and a transparency of a company blueprint, the trainer will explain the fundamentals of reading a blueprint. As the trainer reads, the trainer will point out the various shapes and angles on the blueprint. The trainees will read over the handouts, Fundamentals of Blueprint Reading, Angles and Shapes.

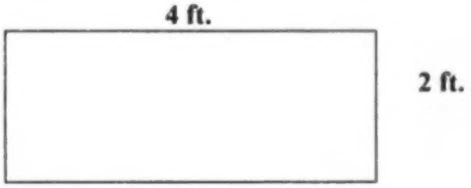
Evaluation: The trainee will complete the exercise-- The Plastics Industry And Geometry.

Extension Activity: The trainees will break into groups with the assignment of redecorating/remodeling the break room. Trainees will use newspaper advertisements to determine prices for paint, wall paper, etc. They have a $20,000 budget. The groups will prepare a presentation board to use during their oral presentations to the large group.

The Plastics Industry and Geometry

Squares and Rectangles

Perimeter



The perimeter is the distance around a figure. It is obtained by adding together all the sides. In a rectangle or a square, you may use the formula:

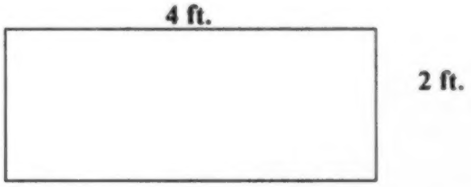
2 x the length + 2 x the width

This can be written more simply as:

$$2 (L + W) = P$$

This is read as two times the length plus the width equals the perimeter. We have simply used abbreviations to replace the words. When working the problem, substitute the numbers given in the problem for the corresponding letters.

Area



The area is the amount of surface contained inside the perimeter of a rectangle or square. It is obtained by multiplying together the length and the width. You may use the formula:

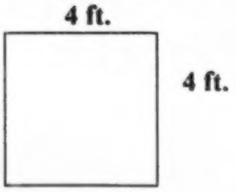
Length x Width = Area

This can be written more simply as:

$$LW = A$$

This is read as length times width equals area. The answer is labeled in square units such as square feet.

Since a square has equal sides, it could be written as $s^2 = A$. This is read as side squared equals area. Side squared means side times side. It does not mean side times 2.

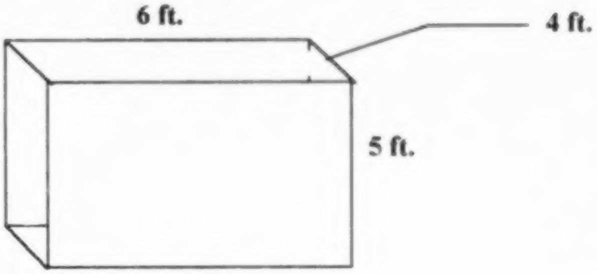


Volume

The volume is the space inside a closed figure. It is obtained by multiplying together the length, the width and the height. You may use the formula:

Length x Width x Height = Volume

This can be written more simply as: LWH = V
This is read as length times width times height equals volume. It is labeled in cubic units.

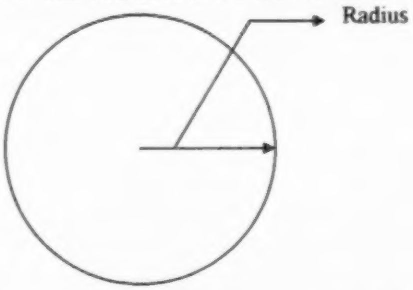


Circles

The circumference of a circle is its perimeter. It is obtained by using the formula:

$$C = 2 \prod r$$

This is read as circumference equals 2 times pi times the radius. Pi is a given number computed hundreds of year ago. It is **always** 3.14. The radius is the distance from the middle of the circle to its outer edge.

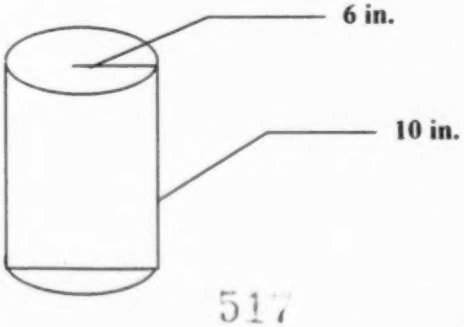


The diameter is the distance from one side of the circle to the other. The diameter is twice the length of the radius.

The area of a circle is equal to pi times the radius squared. This is written as: $A = \prod r^2$
It is labeled in square units.

The volume of a sphere or cylinder is equal to pi times the radius squared times the height
This is written as: $V = \prod r^2 h$.
It is labeled in cubic units.

V = 3.14 x 6 x 6 x 10



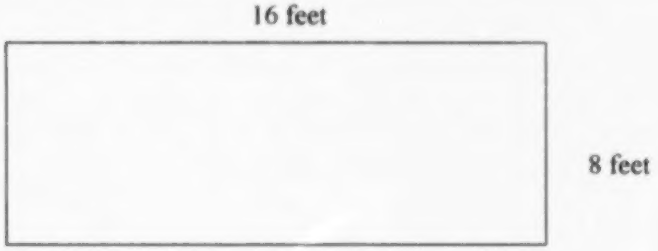
Practice

1. What is the perimeter of a storage area that is 18 feet long and 14 feet wide?

2. What is the area of the storage area in problem 1?

3. How much safety fencing will be needed for an area that is 10 feet by 15 feet?

4. How many square feet of carpeting is needed for the break room pictured below?



5. How many feet of trim will be needed to go around the bottom of the room in problem 4? Remember to subtract for the three foot door and the two six-inch door facings.

6. How much oil will a can that is four inches in diameter and six inches tall hold?

7. What is the minimum amount of four inch tape you will need to wrap around the bottom edge of a box that is 24 inches long and 18 inches wide?

8. How much area of the floor will a barrel of resin that has a radius of two feet take up?

9. How much resin will a four foot square Gaylord, measuring five feet tall, hold if it is filled to the top?

10. How tall is a trailer that has a volume of 128 cubic feet and measures six feet wide and 15 feet long?

11. What is the volume of a sphere with a eight cm diameter and a height of 24 cm?

12. What is the volume of a storage container that is four inches wide, eight inches long, and six inches tall?

13. What is the length of a rectangle that has an area of 64 inches and a width of eight inches?

14. What is the diameter of a circle that has a circumference of 68 mm?

15. What is the radius of a circle that has a diameter of 12 inches?

16 What is the height of a part that has a volume of 27 mm, a length of 3 mm, and a width of 3mm?

17. How much profit must the plant make to cover the cost of an area that rents for $3.15 per square foot if the area measures 18 feet x 48 feet?

18. What is the length of a space that has a perimeter of 36 feet and a side that measures six feet?

19. What is the length of a rectangular space that has a perimeter of 63 feet and a side that measures seven feet?

20. How many square inches of clear wrap is required to cover a tray of parts that is 14 inches tall, 48 inches long, and 24 inches wide? The wrap must overlap all sides by four inches.

PACKING INSTRUCTIONS

Customer:		Part No:	80-02708-01	Revision:		Date:	
Operation No:		Part Name:	SRM180 Container	Prepared By:		Date:	
Mold No.		Part Code	SFT,07	Approved By:		Date:	
Number of Cavities		Standard Part Weight		Customer Approval		Date:	

1) W/P Label

2) 40 x 48 Jones Lids

- Place open end down, side-by-side for 11 pieces per row
- Thus having five rows of eleven and five parts on the end, turned 180 degrees for 60 pieces per layer
- Place lid over bottom layer and fill the second layer for a total of 1320 pieces per skid

Project Future
Competency Area 2.0: Mathematics

Competency Number 2.7: Geometric Concepts

Lesson Number 2.7.2: Determine Proper Size Box for Number of Parts

Lesson Objective: Given parts and several boxes to select from, the trainee will use the Quality Control Requirements Sheet to select and pack the appropriate box by using geometric formulas to determine the volume of the boxes and the volume needed by each part.

Prerequisite Skills:
The trainee must be able to read sentences.
The trainee must be able to compute whole number and decimal values.
The trainee must be able to use geometric formulas.

Literacy Skills:
Trainee will read and apply information.
Trainee will be able to make comparisons.
The trainee will use formulas to solve problems.
The trainee will demonstrate transferance of knowledge.

Presentation:

I. Prior to class, the trainer will secure a Quality Control Requirements Sheet that contains packaging instructions. The trainer also will collect enough of one product to fill a box, several sizes of boxes (including the correct one), and any packing material needed.

II. The trainer will introduce the lesson by bringing out a box and enough children's one-inch blocks to completely fill the box. Using the formula LWH = Volume, the trainer will help the trainees determine the relationship to the blocks in the box.

III. The trainees will complete the exercise, More Practice in Computing Geometric Sizes.

Evaluation: The trainees will compute the volume of the boxes and of the parts and use the information to select the appropriate box. The trainee will correctly pack the box.

Extension Activity: The trainee will compare the volume of a silo of resin to the volume of a Gaylord of resin.

More Practice in Computing Geometric Shapes

Use the information contained in the handout, The Plastics Industry and Geometry, to complete the following problems.

1. What is the volume of a box that is 24 inches wide, 29.5 inches long, and 18 inches tall?
2. What is the volume of a part that is 4 inches long, 2 inches wide and 1 inch tall?
3. How many of the parts in problem 2 will fit in the box in problem 1?
4. What is the volume of a box that is 48 inches long, 3 feet wide, and 1 foot tall?
5. What is the volume of a part that is 16 inches long, 1.5 feet wide, and .5 feet tall?
6. How many of the parts in problem 5 will fit in the box in problem 4?
7. What is the volume of a box that is 28 inches tall, 64 inches long, and 60 inches wide?
8. What is the volume of a part that is 29 inches tall, 60 inches long, and 50 inches wide?
9. How many of the parts in problem 8 will fit in the box in problem 7?
10. What is the volume of an ice-cold can that has a 2.5" radius and is 6.24" tall?

Bonus: What would you do with the can in number ten if you got a break NOW?